



MODEL AIRPLANE

THE WORLD'S PREMIER R/C MODELING MAGAZINE

47380

NEWS

**BUILD A
DC-3!**

Oshkosh

**TECH TIP:
Meeting Wings**

**WARBIRD
RACING**

**R&B:
EZ PT-19
AMS CHAMPION 45**



MODEL AIRPLANE



ON THE COVER:

Recognized around the world by passenger carriers, cargo haulers, island-hoppers and ground-bound VC bad guys, the Douglas DC-3 has been traversing the airways for over half a century. Affectionately known in various circles as the "Gooney Bird," British Dakota, Navy "Roger Four-Door" and Russian Li-Dva, plus other terms of endearment, the DC-3 has always been held in high regard by modelers as well. Budd Davisson's lens captures the full-scale version, while designer Dave Ramsey's daughter enhances the beauty of his 1/16-scale version, which is powered by a pair of O.S. .20 4-stroke engines. A full construction article appears in this issue. Kodachromes by Budd Davisson and Dave Ramsey.

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Airwaves

WHERE TO WRITE TO US

If you're writing to the editors (and we'd love to hear from you), please be sure to address your letters to "Airwaves" *Model Airplane News*, 251 Danbury Road, Wilton, CT 06897. Only subscription orders and inquiries are handled by our Customer Service Department in Mount Morris, IL; other mail addressed there must be forwarded to Connecticut, and this leads to long delays.

This Budd's for You!

Don't let Budd Davisson get away! Sign him up immediately for a writer's contract! Read his review of the Cox EZ-Bee Trainer in the December issue of *MAN*, and he's hilarious!

After just reading about the serious subject of tip vortices from a Boeing 747 in "Dynamics of Helicopter Flight," by George H. Saunders, I almost split my sides when reading Davisson's "the EZ-Bee was so light it reacted to wake turbulence from departing blue jays!"

This was just one of many humorous bits in the article, so if Robert Benchley could gain fame by writing "Through The Alimentary Canal With Gun and Camera" in the 1920s, Davisson can start a new writing career here and now.

KERMIT SLOBB
Northbrook, IL

Thanks, Kermit, glad you like Budd's work. We're managing to get him to do more (as you can see in this issue), but his preoccupation with doing a photo-illustrated treatise called "Through the Panama Canal with Gum, Camera and Floatplane" has had most of his recent attention. He has, however, discovered that lead tire weights do melt when heated and is on his way to becoming a fair R/C flier—if we can keep him in airplanes!

RAU

Encapsulated MAN?

As mayor, on behalf of the entire Lakeport City Council, I commend your publication for its excellent support and coverage of the Clearlake radio-control model seaplane events during past years.

These events have furnished much pleasure and entertainment for thousands

of spectators, many of whom have never seen radio-control model planes fly from the water. Local merchants also appreciate the added business derived from the many tourists who come to see these events. We also appreciate the high caliber of people these events draw into our community—both participants and spectators.

We're presently expanding our lake-side park by several acres and are looking forward to many events of this kind. We value your continued support in publicizing these future events.

Thank you for your past support and for a copy of *Model Airplane News* for our time capsule. Fifty years from now, when this capsule is opened and this publication is examined, they'll realize the pleasure we had way back in 1988.

ARLIN PISCHKE, Mayor
Lakeport, CA

Thank you Mr. Mayor, from all of us here and all the modelers who've enjoyed the results of your efforts in bringing the sport of aeromodeling to the public in such a positive way.

Be assured that the progressive thinking and actions of your city management team in its support of R/C activities makes it paramount for recognition and our reciprocal support. We only hope that the type of cooperation that exists between the city of Lakeport and R/C enthusiasts will be shown by other city/county governments.

We consider it a distinct honor to be included in the contents of your time capsule and plan to be around when it's opened 50 years from now. May your city's motto of "Over 100 years of community pride, progress and service" continue beyond your bicentennial celebration.

RAU

Gottcha!

The article "The Shadow Box," in the December '88 issue was quite interesting. However, wouldn't it be extremely difficult to do left and right snap-rolls

(Continued on page 8)

MODEL AIRPLANE NEWS

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Airwaves

(Continued from page 6)

with the sticks in the positions shown? No doubt, these illustrations suffer from that well-known virus "Captionus Reversus."

Also, referring to Fig. 1, does the author always do right turns with the stick in the right corner? Should make for some interesting turns, all right! Otherwise, it was a very enjoyable article.

DON NIX

Powermaster Products, Inc.
Santa Fe Springs, CA

OK, OK, Don, I'm a beginner at the editing thing, also. You're absolutely right on the switched captions, or did we have the servo-reversing switch in the wrong position? Thanks for the catch!

RAU

Aluminum Allergies

As a relative newcomer to model planes, I use your magazine for guidance and information. I have a problem with which I need help. I purchased a Goldberg Piper Cub and I decided to cover the fuselage with .009-thick aluminum. The plane looks terrific, and I hear many compliments from fellow fliers.

The problem is, I get occasional glitches in the radio—a Futaba FP-TF-AM FG series. I removed the antenna from the rudder and ran it down the left wing. This greatly reduced the problem, but I still have glitches. For obvious reasons, I don't want to remove the aluminum unless I have to. Any suggestions, like an FM radio, etc.? I'd appreciate a response from you or your readers.

CHARLES CONOVER
Greenlawn, NY

Charles, an FM set may provide some improvement, as might a vertical whip antenna, which is very popular in Europe. I suspect that the aluminum is working much like "chaff" does, reflecting a radiated signal, seriously impeding the antenna's ability to "capture the wave" for the receiver. Can any readers shed some light on the subject?

Incidentally, why take a model of a full-scale "rag"-covered airplane and clothe it in "tin" anyway?

RAU

Liberator in Perpetuity

In my quest for a "Jack Stafford" R/C 7-foot-wingspan B-24J Liberator, I chanced upon your Editorial in the August '88 issue of *Model Airplane News*.

Your down-to-earth attitude concerning the plight of the novice model airplane builder makes me feel that

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Adjacent Channel Rejection:	Better than -69.4 dB @ + 8.5 KHz -77.3 dB @ -8.5 KHz	Better than -81.3 dB @ + 8.5 KHz -69.2 dB @ -8.5 KHz
Image Rejection:	-67.1 dB	-70.8 dB
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you're my last hope in locating a kit of the type mentioned above.

I've exhausted all the avenues I know of, and have had no luck at all. The only thing I have in my possession at this time is the full-scale plans, but I haven't the slightest idea how to go about getting the necessary wood and other supplies needed to build such a model. I plan to scout about for someone to build it for me, as the completed model would be presented to the 454th Bombardment Group (H) Association at its next reunion in October of 1989. I'm a member of the organization, having flown the B-24 (all models). It was the B-24J that I was flying the day our crew was shot down in 1945. I want to present this model to the organization, which, in turn, will present it to the United States Air Force Museum at Wright Patterson Air Force Base, OH.

I want this model to be radio-control for a one-time flight before the presentation so that old-timers can have the thrill of seeing the old bird airborne one more time, even though only as a model. Anything you can do to assist me in my quest would certainly be appreciated. Thank you.

JOHN F. THOMAS
M/Sgt. USAF (Ret.)
4 Bucksport Court,
Catonsville, MD 21228

All right, R/C scale fans, here's a golden opportunity to start the new year right. Make a long-term, meaningful contribution to our sport, and have your work immortalized and appreciated by aero enthusiasts while displaying it alongside some of the most historically significant airplanes ever produced.

This could be a nationwide project! If you can partake in any or all of this

undertaking, please contact M/Sgt. Thomas direct. We'll keep you posted as more info becomes available.

RAU

Stop and Smell the Balsa

I'm 16 and have been flying model planes for about a year, but have been interested all my life.

It's a very rare hobby here in South Africa, but it's relatively easy to get planes and radios, if you know where. However, they're very expensive, and there are only the well-known brands like EZ, Royal, Black Baron, Du-Bro and Goldberg. We pay double and sometimes triple here for the same thing you get, due to the 60-percent customs duty and our low exchange rate. Parts for engines, like HP, are very expensive; we have only one hobby shop in the whole of South Africa officially selling

(Continued on page 12)

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Editorial

by RICH URAVITCH

HERE WE ARE AGAIN! It's 1989, and another year has, both literally and figuratively, flown by! Did you get all the R/C goodies you asked Santa for? Sure hope so, 'cause it's going to be a great year for modeling. How about those resolutions I mentioned last month? Still intact? Doing something about them? Great! We're sure going to try hard to hold your interest, so we thought we'd start the ball rolling by telling you a little about what we've got planned.

First off, a sincere thanks to all of you who took the time to respond to our reader's survey. The tremendous response was gratifying and some of your comments were enlightening. It's nice to know that we're doing a lot of things right—and very helpful to know where we've slipped up! I will say that most of you pulled no punches when it came to the "what you disliked" question, and we appreciate it. We haven't completed studying all the returns yet, but some of the issues are pretty clear and we'll start working on them. We'll announce the winner of the PCM radio (nearly forgot about it, didn't you?) in the next issue. The reward for the rest of you will be, hopefully, a *MAN* that's responsive to your input.

The construction feature this month is the outstanding Douglas DC-3 Gooney Bird, Dakota, Puff, or "whatever," designed by Dave Ramsey. Dave did his homework on this perennial favorite and ended up refining the design by building a second, lighter version. You readers must have loved it too, because you voted it into 2nd place in our design contest. We hope it answers your requests for more scratch-built scale projects; many more of these are planned for future issues.

For you helicopter fans, here's the scoop: Later on this year, we'll have additional pages in *MAN* to accommodate an entire helicopter section. (It will not diminish any of the existing content.) After careful consideration, we've concluded that it's time the helicopter enthusiasts had a home-grown, red-white-and-blue vehicle to address their special interests. So, we've lined up some additional heli gurus (and we're still looking for more), and as soon as the final pieces are in place, we're off and hovering! I'm really excited about this one! I might also mention that the last time we had similar feelings about a "specialized group," we committed our

resources and the results were our very popular sister publications, *R/C Car Action* and *R/C Boat Modeler*. Who knows?

We feel that 1989 will be a great year for the sport, and we offer the following "predictions":

- Electric power will become much more widely accepted as performance is improved by lighter, more efficient batteries.
- ARF-type models will continue to gain in popularity with more specialized types becoming available—maybe even jets!



- The popularity of scratch-building will remain at about its present level, and may, perhaps, even wane a bit, due mostly to attrition and a shortage of newcomers who enjoy flying, but have neither the interest nor the time to build.

- Kit building may be heading down the same primrose path as scratch-building, only to a lesser degree. Reason? How many new kits have you seen recently? It's not the manufacturers' fault either. They go the "safe zone" (i.e., "return on investment"), which has many of them developing trainer-type airplanes to woo the newcomers. How many high-wing, cabin-type, flat-bottom-airfoil, .40-powered

airplanes can the market absorb? Conversely, how large is the market for more sophisticated advanced-level airplanes? Is it large enough for a manufacturer to tool up, knowing that his product may end up stillborn as a result of "foreign intervention" in the form of an ARF import priced in the same ballpark as his newest release? It's tough out there!

- We'll be another year closer to "1991" and probably no closer to a clear understanding of the AMA/FCC fiasco than we were in 1988; it's just a year less that we have to do anything about it.

- More clubs will lose more flying sites in more areas of the country, due mostly to apathy or arrogance. We've all seen it happen, but have probably convinced ourselves that "it won't happen to us." Don't be so sure!

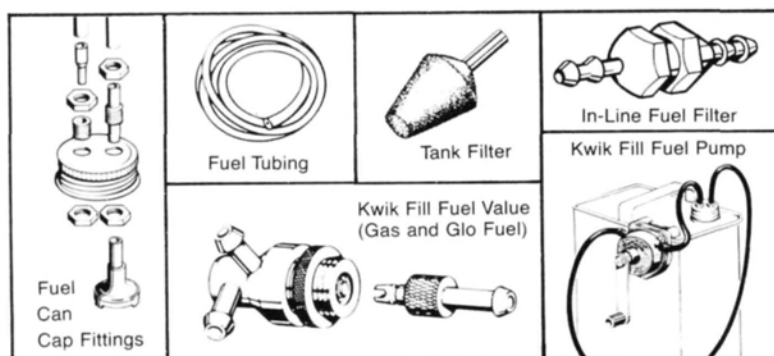
Now that I think about it, these aren't as much "predictions" as statements of the obvious, recognized simply by looking around. I was never much of a soothsayer, anyway; I was the guy who was convinced that CAs would never find widespread appeal among modelers! ■

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Airwaves

(Continued from page 9)

them. I've been waiting for a ring and a set of gaskets for two months, and they won't be here until early next year!

I'm on my second plane—a Goldberg Sky Tiger. I paid 300 rand for the kit alone—about the same as \$300 to you, taking into account salaries in both countries.

It's the same for magazines; they are very hard to get, especially MAN (out of 10 newsagents, one may get one or two every month). If I can get them, I pay about five times more than you do! It's a great magazine and I buy it whenever I can find it. I've been "collecting" it for almost a year now, and only have three issues; I've decided to subscribe so I don't miss any issues. Boy, you don't know how lucky you are!

IVAN FRIMMEL

Ravenmoor, South Africa

Ivan makes a great point here. Think about it.

RAU



MAN Fan

Thanks, in part, to MAN, I'm again about to enter the hobby of model aircraft. This time, it will be R/C aircraft.

I enjoyed the articles in the Dec. '88 issue on trainers, as they helped me decide on my first plane. It will be a Goldberg Eagle II and an O.S. 40FP.

You can count on a new reader and subscriber.

WARREN J. STROSSER

Muskegon, MI

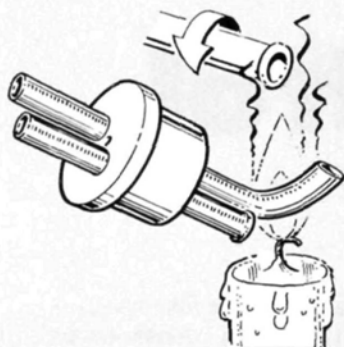
Thanks, Warren and welcome aboard.

RAU

Erratum: Oops! In Budd Davisson's review of the Sky Lark 40T in our January issue, we used a picture of Pan Am pilot Howard Jones (another of Budd's flying buddies) with the sidebar written by Jim Roberts. Apologies to both.

Hints & Kinks

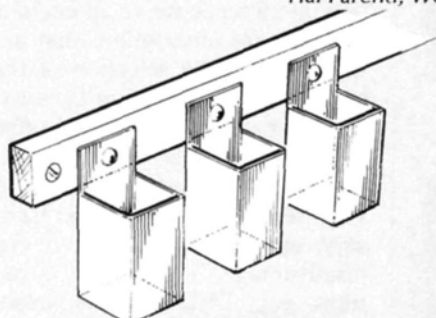
by JIM NEWMAN



NYLON-TANK PLUMBING

Have you ever had a mysterious fuel-feed problem, only to find that it was caused by a nearly invisible split in the brass tubing inside the tank? End all that grief by making the tubes out of the nylon tubing used to house flexible cable pushrods. To make permanent curves, just gently heat the area over a flame. Likewise, to make a nipple to retain the flexible tubing inside the tank, heat the end of the nylon tube in a flame, rotating it as you do so. This causes a raised ring to form on the end of the tube.

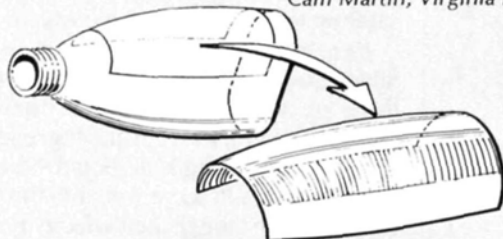
Hal Parenti, Westchester, IL



ZERO-COST TOOL CADDY

Save those Hot Stuff plastic packages. Reinforced with a little tape, and thumb-tacked to a shelf, they're ideal for storing small brushes, balsa knives, etc.

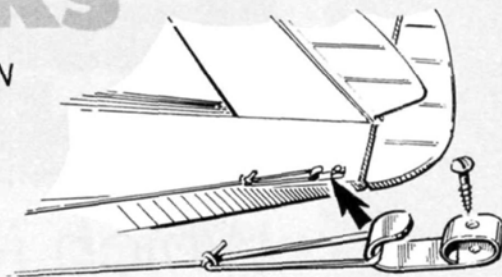
Cam Martin, Virginia Beach, VA



FREEBIE CANOPIES

This enterprising modeler found ready-made canopies in the form of household cleaning-products containers. Most of the transparent bottles available today are molded in a polycarbonate plastic, which is glass-clear and very tough; find one that fits your needs, and cut out your canopies. Our contributor didn't say which adhesive he used, so you might have to experiment on a piece of scrap plastic. I've always found that Wilhold RC-56 works well on plastics.

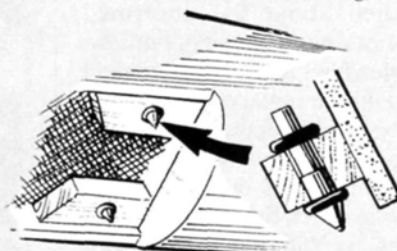
Lee Baer, Fresno, CA



ANTENNA HOOK

Preferring to run his antenna along the side or underside of the fuselage, our contributor found that a handy hook was as close as his dime store, or even the household nuts 'n' screws jar! The small hook he used is of the bent, metal variety used to hang small pictures and, in fact, one could clip off the doubled-over part to make an even tidier installation.

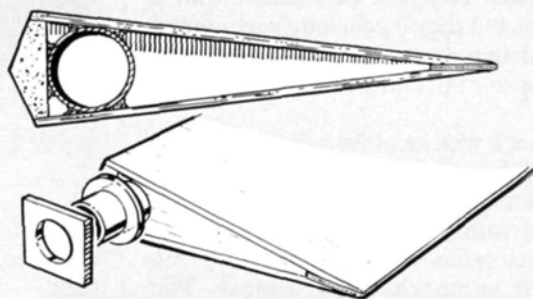
Warren Goldman, Johannesburg, South Africa



WING-BOLT ALIGNMENT

If you've ever had to build a replacement wing, you'll know how tricky aligning the new wing to the existing attachment bolt holes can be. Here's how one builder does it: Shorten a couple of ball-point-pen refills, slip a small O-ring over the point, then insert the refill into the bolt holes in the mounting blocks, capturing it with a second O-ring slipped over the top. If the refill is too slack in the bolt holes, wrap a strip of masking tape around it to increase its diameter. Now, carefully set the wing in place on the fuselage, and when it's properly aligned, press it gently onto the refills, which will plainly mark the bolt centers.

Tony Kollaja, Katy, TX



TUBULAR AILERON SPARS

To build stiff ailerons and flaps and to minimize warping, this builder incorporated thin-wall aluminum tube spars into those components, and he also recommends that the balsa covering be applied with the grain chordwise. At this point, I can see a need for trailing-edge stiffening, so I recommend that you also sandwich a narrow strip of 1/64-inch plywood or carbon fiber at the trailing edge. Note the plastic shim washer and the plastic bearing in which the tube can turn for aileron hinging.

Lincoln Ross, Waltham, MA

Model Airplane News will give a free one-year subscription (or one-year renewal if you already subscribe) for each idea used in "Hints & Kinks." Send rough sketch to Jim Newman, c/o Model Airplane News, 251 Danbury Rd., Wilton, CT 06897. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO, AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we cannot acknowledge each one, nor can we return unused material.

Basics of Radio Control

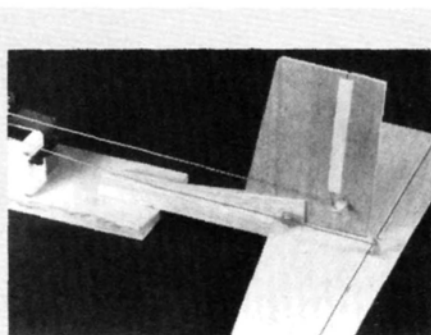
by RANDY RANDOLPH

Which R/C System?

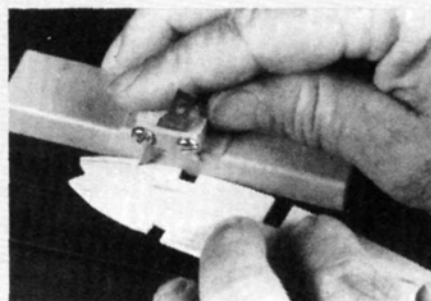
MUCH HAS BEEN written about the changes that will be made in our R/C channels and systems in 1991. Some of the information that's bandied about by "informed sources" is not only confusing, but also actually misleading! Since all equipment must eventually be replaced or updated (the R/C system is actually the *least* expensive part of the airplane), some simple, honest advice about buying new equipment is in order. Save yourself a lot of problems by following these few suggestions before buying any new equipment.

A system that's 100-percent perfect just doesn't exist; even in the most ideal situations, some operating problems and failures can happen. But the more care taken in the selection and operation of a system, the less likely problems will be. The following choices won't absolutely guarantee complete satisfaction with a system, but they'll go a long way toward eliminating some of the pitfalls that may not be too obvious to those new to the sport.

- Check with local fliers, R/C clubs and hobby shops for the channels that *must* be avoided in your area. Our channels are mixed with much more powerful commercial radio services, and these can render some channels useless. The affected channels differ between areas, so local information is vital. There's supposed to be a Frequency Coordinator in each AMA district who keeps track of this sort of thing, but his information is only as good as that which he receives from fliers in each locality. It's a lot easier to start with equipment on a clear chan-



A simple sheet mock-up to demonstrate control operation. See text.



Another use for the balsa stripper!

nel, rather than to be subjected to the inconvenience and expense of changing later!

- Don't buy or use equipment on channels 12 and 56, because channel 12 can cause problems with channel 56. The problems can be reduced by the use of a properly designed dual-conversion receiver. (The key words are "properly designed" and, since that's an unknown, the easiest answer is avoiding these two

channels in the first place!)

- Look for a "double-balanced mixer" in the receiver you buy and, if the receiver is one of the dual-conversion types, it should have two! There are many buzz words used to describe receiver performance, and most of them mean little, but this one *does* mean something! This type of mixer is less affected by overloading, which causes the infamous intermodulation interference we've all heard about.

There are other things that are fairly important in the selection of that new system. AM modulation is every bit as good, or better, than any other type available, regardless of the price, and they're just as "narrow banded" as well. High sensitivity in a receiver isn't necessary, and, in some cases, it can be a disadvantage. The various luxury features, e.g., LED displays, exponential rates, channel mixing, etc., add to the enjoyment of flying, but add nothing to the reliability of the system, so buy what you like and enjoy, but don't expect a safer system just because it costs more!

I know of no better receiver than the Silver Seven from Ace Radio*. In fact, there are very few that good! I haven't seen Ace's Model 91, but, having read the specifications, I think it should be even better and should serve well into the next century. Even though their selectivity isn't as sharp as that of the new model, the Silver Seven might well be adequate (though Ace doesn't recommend it) with the new, closer, channel spacing of 1991.

Most of this pertains to receivers, because they're the important link with the airplane. Current transmitters, as

(Continued on page 59)

D O U G L A S



DC-3

by DAVE RAMSEY

Construction

A 1/16-scale version of a timeless classic: This design returns us to "scale model building" and provides the builder with a gentle flying twin.

THE DOUGLAS DC-3 has probably had the longest active flying career of any airplane, ever. It's hard to imagine, but it has been around for over 50 years and is still going strong. It has been used by nearly every nation in the free (and not-so-free) world, to the point of being copied almost rivet for rivet. With this kind of popularity, it shouldn't be surprising that it's a modeling favorite also, so we were obviously pleased to receive this design as an entry in our Design Contest. After all the votes had been tallied, Dave Ramsey's delightful Douglas took second-place honors, and this clearly indicates just how much you modelers liked it.

Dave did a very thorough job in designing and developing his DC-3, even to the point of building a second, improved version. He wanted to make certain that it flew well, and so did we, so his second version is the one that's presented here. As with our presentation of Doc Linton's Vindicator,



From any angle, this DC-3 is classic. Effective use of burnished chrome MonoKote looks great and saves weight.



due to the level of detail involved, a step-by-step construction manual will be provided with the full-size, two-sheet plan.

We hope you enjoy the article, we encourage you to build your own version, and we invite you to send us some photos of the completed project.

On a fly-by with its O.S. 4-strokes purring smoothly, the DC-3 presents a very realistic appearance.



Our smiling designer, Dave Ramsey, is justifiably proud of his accomplishments: a scale, good-flying, manageable-size twin.

WHAT A WONDERFUL airplane! For as long as I can remember, I've had that feeling about the DC-3. Many years ago, I designed a retractable landing gear with the idea that I would build the model but, at that time, a DC-3 just wouldn't fly with a Galloping Ghost radio!

Then, about three years ago, I designed and built a small WWI airplane called the BAT Baboon, and I used an O.S.* FS-20 for power. I was quite impressed with that engine. What would two sound like? The DC-3 would be perfect. I began collecting information on the DC-3 and settled on a scale of $\frac{3}{4}$ inch to 1 foot. The most useful tool for scaling the DC-3 was the Testors $\frac{1}{72}$ -scale plastic DC-3 kit. To arrive at the desired scale, I simply measured the plastic model with a dial caliper and multiplied these dimensions by 4.5. There are only two deviations in the outline of this model. The first was an increase in the wing center-section span: 1.5 inches was added to achieve a safe prop-to-fuselage clearance for 9-6 props. The second was a chord increase in the tip to achieve just slightly more wing area. This also increased the wingspan, as the wing tips were reshaped according to the wider tip chord.

While the model seems to be of a good size, judging from the 75.25-inch wingspan, it really doesn't have all that much wing area. Measuring only the mean areas of the wing (not including the engine/nacelle section of the wing or the wing tips past the tip rib), it has only 503 square inches. There are other contributive lift factors for the DC-3, e.g., wing thickness and fuselage shape. However much the lift factor might be, I decided to leave that as a safety margin and plan a model weight of 5 pounds and a wing loading (with any luck) of approximately 20 ounces.

SPECIFICATIONS

Wingspan: 75.25 inches

Length: 49 inches

Weight: 6 pounds

Wing area (min.): 503 square inches

Wing loading: 27.5 ounces per square foot

Engines: O.S. FS-20 (2)

Props: 9x6 (2)

Fuel tanks: 4-ounce RST (2)

Radio: Futaba 6FGK, 3 S128 servos, 2 S132 servos

Covering: Chrome Super MonoKote

The DC-3's first flight wasn't at all what I'd hoped for, as I stalled it on liftoff. This stall was unlike any I'd ever experienced. The liftoff was perfect and straight, the tail was up as I applied full power, and, in about 50 feet, it was flying in ground effect. The climb angle looked good, so I let it go. At about 20 feet, it started a shallow turn to the left and I applied corrective aileron only; as there was no response, I put in some right rudder, only to have the nose pitch up as it came around to the right. What followed was a very hard landing! So much for two props and a landing-gear set! For the next attempt, I moved the CG forward and added 2 degrees down-thrust to each engine. The second take-off was much like the first, but this time,

I kept the nose down and flew faster out of ground effect. The next 10 minutes were wonderful: You wouldn't believe how good those two O.S. FS-20s sounded together, nor the power they produced.

In case you're wondering about the ability of two O.S. FS-20s to fly the DC-3, this is what they handled: Total weight without

DC-3

50 YEARS OF GREATNESS: THE GOONEY BIRD

by BUDD DAVISSON



WITH OVER HALF a century of Gooney Bird lore behind us, it's hard to imagine aviation without that venerable old workhorse. Ignoring its wartime records (which is impossible to do), its civilian exploits alone are good for thousands of pages of good reading.

The descendant of the externally similar DC-1 and DC-2, the third of the series first stepped into airline livery in the late '30s. Most of the present generation of airplane buffs forget that before WW II, the DC-3 had already revolutionized airline travel and totally eliminated the competition. The monoplane concept in big transports wasn't even five years old when Douglas hit the airways with its new designs. Its closest rival, the Boeing 247D, didn't have a chance, and the DC-3 went on to dominate air travel until the newer four-engine designs took its place on the longer legs. To this day, however, it has never been totally replaced for shorter, commuter-type flying.

Many air forces still depend on the C-47 (as the military called it); others are now releasing their inventories of C-47s, and that's welcome news to operators

hungry for new supplies of airplanes. The Canadian and Alaskan back country couldn't survive without fleets of Gooneys that supply their daily needs; the same is true in many areas of the world where runways are short and terrain terrible.

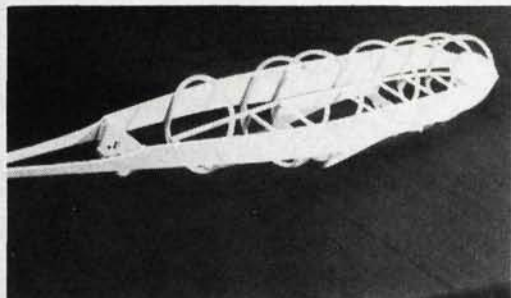
As if seeking a second life, modifications to the airplane include replacing the round engines (Wright R-1820s or PW R-1830s) with kerosene-burning turbines. These new engines not only give the old bird incredible performance, but also increase the payload by thousands of pounds, because they're lighter.

Will we ever see the end of the old Douglas Cruiser? Probably, but not in our lifetimes and probably not during our kids' lifespans, either. The Gooney will be with us as long as there are loads to carry, costs to cut and places to go. ■

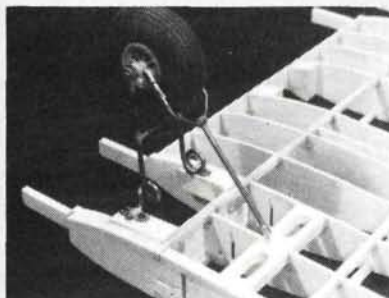
fuel: 7.66 pounds; wing loading: 35.13 ounces. Most model jets don't have *this* wing loading!

The next four flights went well and allowed me to take some photographs and to study the flight characteristics. The sixth flight was disappointing and much like the first: The plane stalled again on takeoff.

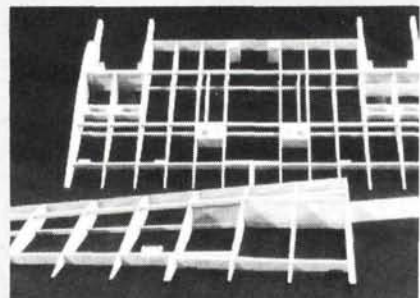
This first DC-3, which was entered in the *Model Airplane News* Design Contest, proved to be a good flier. However, due to the heavy wing loading, it required a great deal of care during takeoff and landing. The stall characteristics were docile, hard to foresee and yet very positive. The only bad part of the design was the plane's overall weight, which dictated that it had to be flown



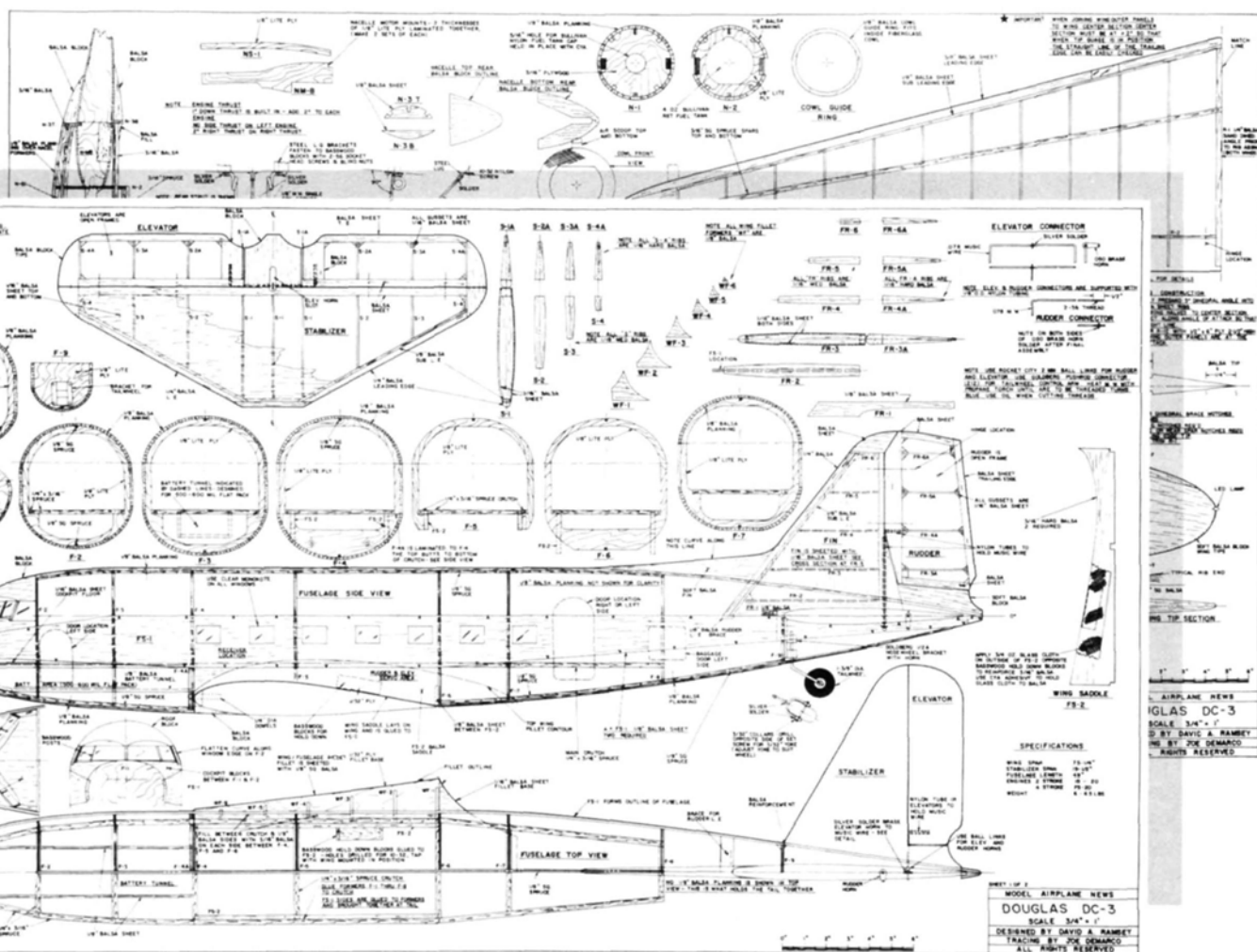
Basic fuselage assembly before adding the sheeting and planking.



Landing gear installed on wing center section.



Wing center section with left outboard fitted and right outboard panel. Clean build apparent.



ORDER THE FULL-SIZE PLANS ... PAGE 120.

fast—much faster than I wanted to fly on takeoff and landing.

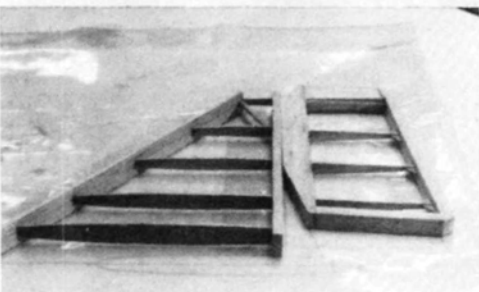
After the seventh flight on the first DC-3, which quickly ended in a stalled takeoff, I decided that rebuilding after the resulting damage would only yield an even heavier wing loading. My only choice was to redesign and build another. Lighter materials were used on the second model for an all-up weight of 6 pounds 4 ounces, and this lower weight yields a wing loading of 27.5 ounces.

ORDER THE FULL-SIZE PLANS



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DC-3**

The DC-3, a long-time modeling favorite, is presented in 3/4-inch to 1-foot scale, yielding an overall length of 49 inches with a span of 75.25 inches. The prototype used a pair of .20 4-stroke engines, but .20-.25 2-strokes would work equally well. All-wood construction. Although it isn't difficult to build, it requires intermediate building and flying skills. Two-sheet plan, plus construction manual.

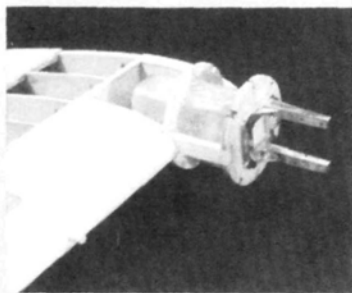


nd rudder ready for shaping after adding 1/16 balsa
ting.

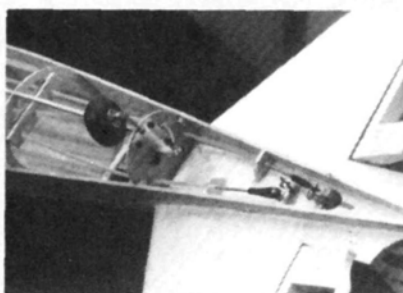


Empennage after sheeting, sanding and
installation.

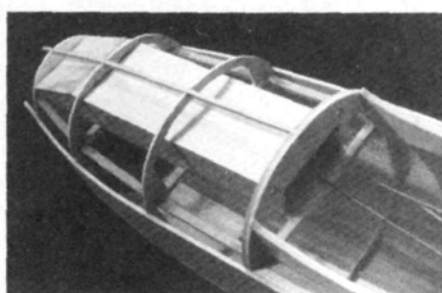
DC-3



Engine nacelle prior to planking.



Elevator, rudder and tailwheel controls installed prior to fuselage planking.



Battery tunnel installed prior to fuselage planking.

In a way, my prototype DC-3 model has proved to be not unlike the full-size DC-3 in its ability to fly well, even when above gross weight. With full power, the first takeoff run (from a sod field) was about 30 feet. Visual scale flight speeds were now possible, without the danger of stalling. It was necessary to keep slow-speed turns on the wide side, as tip-stalls would occur if the turns were too tight. With the lighter wing loading, landings are a joy. While not necessarily a scale maneuver, the DC-3 does beautiful loops from level flight at half throttle.

I've tried to give my DC-3 a scale appearance, and, with the exception of the wing deviations, I think I've suc-

ceeded. My intention was to have a pleasing, well-flying twin-engine model. A lot more could be done to make this a super scale model, but the model is limited in this respect by its size and wing area.

All the construction photos and the plans included in this article are of the lighter model, and if I haven't put you off with my tales of woe about heavy wing loadings, I'll re-emphasize that careful attention to the weight of balsa chosen for construction will produce an excellent flying model.


This model is not a beginner's project, so I won't go into great detail. If building is your pleasure, you're looking at about

200 to 300 hours for completion. Countless hours have been spent on the design development of my DC-3, and every moment has been enjoyable.

My special thanks to all who decided that my DC-3 was worthy of their vote in the *Model Airplane News* Design Contest. To my friends and Tri-County R/C Club members, who all showed interest and offered their support, thank you!

If you want to build the DC-3 and have any questions, I'll be glad to help.


*Here is the address pertinent to this article:
O.S.; distributed by Great Planes Model Distributors, 1608 Interstate Dr., P.O. Box 4021, Champaign, IL 61820.



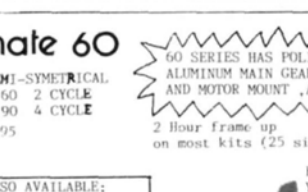
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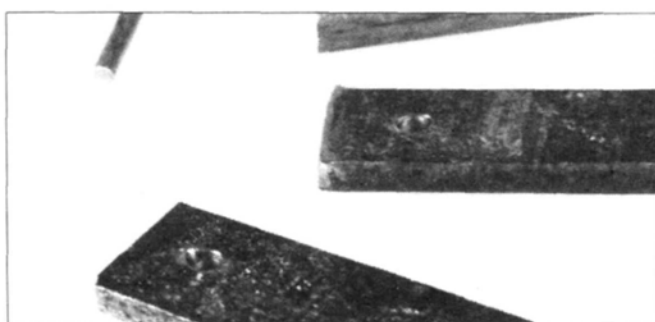
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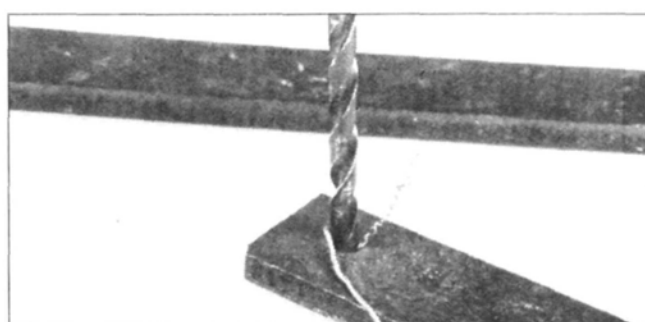
by RANDY RANDOLPH

BEND HEAVY WIRE

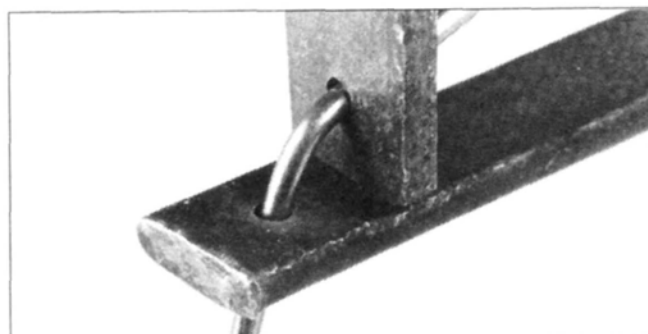
Bending steel music wire has always been difficult, especially in the larger sizes. The following technique, suggested by John Gill, is a simple and inexpensive way to handle up to $\frac{3}{16}$ -inch-diameter wire and even larger sizes. The photos show the way.



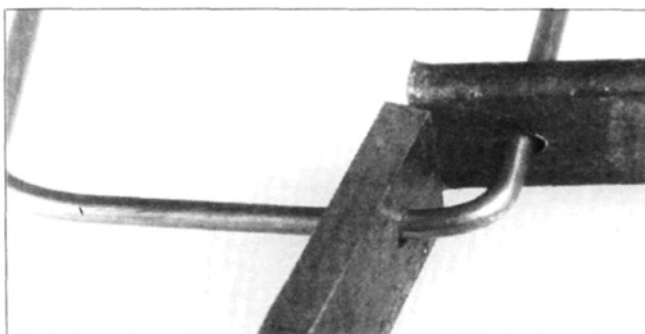
1. The materials needed are: two pieces of $\frac{1}{4}$ x18-inch iron bar stock, an 18-inch piece of $\frac{1}{2}$ -inch steel tube, and a drill, $\frac{1}{32}$ inch larger than the wire to be bent. The metal is available at most junkyards at very reasonable prices, or you can buy it at lumber or hardware stores.



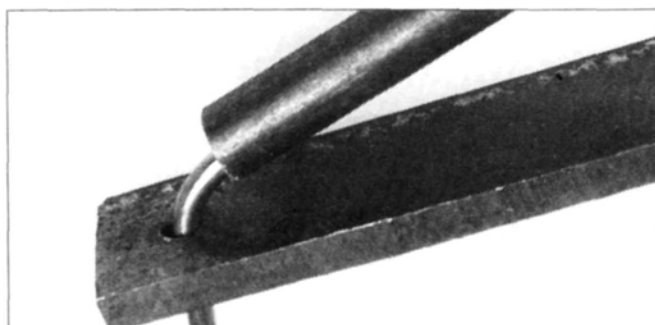
2. Drill holes in both pieces of iron about the same distance from the ends as the diameter of the wire to be bent. For a more versatile tool, holes of different sizes for various sizes of wire can be drilled in the opposite ends.



3. To use the tool, mark the location of the bend on the wire, then insert the wire into the holes in both tools so that the bend mark is between them. Hold both tools 180 degrees apart and bend the wire to the desired angle by bringing the tools together.



4. Complex bends can be made in the wire by sliding the tools along it to the location of the next bend. This is very difficult to accomplish with the hammer-and-vise routine.



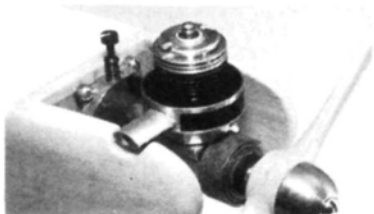
5. Bends with sharper radii can be made in wire if one tool is used in conjunction with the piece of steel tube. This works well on landing gears when forming the axle bend. Again, bring the tool and the tube together to form the bend. (The bend mark should be between the top of the tool and the tube.)



6. This example was bent in $\frac{1}{16}$ -inch steel wire to show the versatility of the two-tool technique. You may need a little practice to become comfortable when handling the tools, but eventually, bending heavy wire won't be a problem.

Small Steps

by JOE WAGNER



A close-up of the Whizard's Cox QRC engine shows the home-made lead spinner and wrapped-on drapery-weight ribbon that it took to bring the model's CG to where it belongs.



Above: Despite its long nose, this Ace Whizard came out tail-heavy. A poor choice of covering material made the addition of 2 ounces of nose weight necessary.

Left: A lightened, lengthened fuselage, a new all-balsa tail 3½ inches farther back, and a different Cox .049 engine made this reworked EZ-Bee a great flyer.



A COMMON PROBLEM with small R/C airplanes is getting them into the air. Takeoffs from the ground are often difficult, since wheels less than 2 inches in diameter don't run well over grass, unless it's dense and very closely mowed. Wheels less than 1½ inches sometimes won't even roll smoothly on a blacktopped runway. Running over a low hump or a protruding pebble has the same effect on a miniature model tire as a brick does on a motorcycle wheel.

Concrete runways are ideal, but few clubs and even fewer individuals can afford them. Another problem is changes in wind direction: A long strip of smooth cement isn't much help to a small, low-powered R/C model when the wind is from the north and the paved area runs east to west.

But there is a solution: the official "Small Steps" portable runway! The accompanying sketches show how easy it is to make one of these. I don't have an actual photograph of it yet; however, the design is based on a similar portable runway/racecar track that I used at least three times a week for several months,

during a nationwide model-demonstration tour I made for the Model & Hobby Industry Association in the late '40s.

The Small Steps runway is inexpensive, easy to build, and should last indefinitely, if properly constructed. Assemble it with epoxy glue and zinc-plated screws, and finish it with at least two saturating coats of a waterproofing compound such as DAP's "Woodlife" clear wood preservative. (This stuff is as thin as kerosene, and penetrates deeply into wood to protect it from moisture, mildew, mold and dry rot. You'll need two gallons of it for the runway shown.)

Because the S.S. Runway is held together in much the same way as electric train tracks are; it's quick and easy to set up and take down—and to relocate if the wind direction changes. Of course, other joining methods can be used, if you prefer, but this arrangement is the simplest one I know.

The alternative to rise-off-ground (ROG) takeoffs is hand-launching. This isn't difficult with a high-wing model airplane, since it can be gripped at its balance point and sent into flight as easily as tossing a folded-paper glider. It's not

quite as easy as it looks, though. Common errors are launching too fast and too steeply. The best hand-launch technique is more of a push than a throw, and almost horizontal rather than upward, like a javelin toss. Ideally, the model should enter the air in the same attitude and at the same air speed as it would from a runway takeoff.

Hand-launching is more difficult with biplanes and low-wingers. Not being able to hold these models under their center of gravity makes it hard to get the feel for the right speed and angle of launch. With a Piper Cub-type airplane, you can easily sense its readiness to take wing as you near the instant of release. You automatically adjust the launch angle and speed for the model to lift smoothly away from your hand.

Ordinarily, for hand-launching, low-wing aircraft and biplanes can only be held well behind their balance points. Too often, this makes for faulty launches, because of the difficulty in sensing the proper speed and attitude for beginning the model's flight. Ralph Pearson, of Falconer, NY, (whose R/C airplanes

(Continued on page 28)

SMALL STEPS

(Continued from page 26)

have been pictured previously in this column) has built recessed finger grips into the underside of the wing center sections of some of his low-wing and biplane R/C models, so they can be held properly for hand-launching. Although this is a clever solution, it *does* weaken the wing somewhat. It probably wouldn't be advisable to use this method on an airplane weighing much over 40 ounces: Your grip between thumb and forefinger

Tail-heaviness is another pesky problem we R/C airplane fliers often have to conquer. Weight behind the wing is mighty hard to keep to a minimum, although we know how important it is to keep the tail section light. When we check the balance-point location (often called CG, for center of gravity) of our latest flying machine and find it aft of where it's supposed to be, something *has* to be done! Tail-heavy airplanes are

far forward as you can get it; that reduces the amount needed. To cure tail-heaviness on Cox-powered airplanes, I sometimes use a lead spinner. Start with a piece of 1/8-inch i.d. brass tubing about 1 inch long, with its outer surface "tinned" with solder to provide a reliable bond between the tube and the lead to be cast onto it.

Next, drill a 5/8-inch-diameter hole through a piece of 1/2-inch-thick scrap hardwood. In another piece of hardwood, drill a 5/32-inch hole and insert the brass tube into it, so that a little more than 1/2 inch protrudes.

Now the wood scrap with the 5/8-inch is placed over the one with the brass tube and centered around the tube as accurately as possible. The two wooden pieces can be glued together in this position with epoxy or CA. This assembly forms the mold into which you pour the molten lead. Melt it in a ladle on the kitchen stove, using just enough heat so that the metal looks bright and flows freely—not so much that its surface rapidly turns dull and gray.

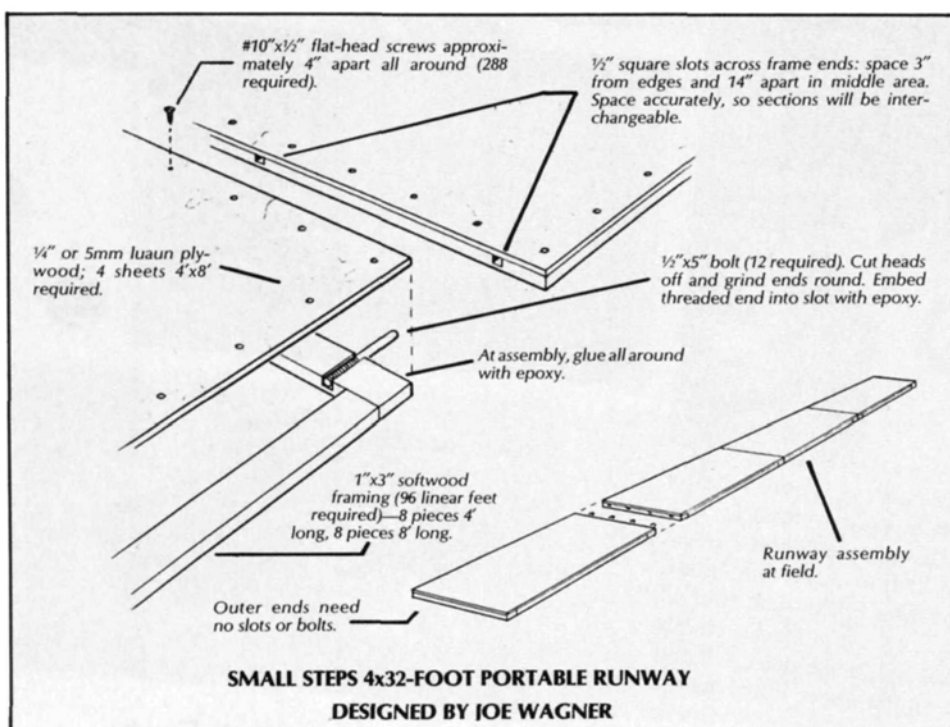
Over-fill the mold just a little to allow for shrinkage as the molten lead solidifies. After letting it cool for half an hour, file the lead flush with the top surface of the wooden mold. (Do this only with a coarse file, such as a rasp or a vixen; regular files clog badly when used for cutting soft metals such as lead.)

Now, split the mold to free the lead casting. With a piece of 1/8-inch wire inside the brass tube (to prevent it from collapsing), put the tube end in a drill chuck to rotate the rough-cast lead slug (as if it were in a lathe) and shape it into a nice, smooth, spinner contour. A very coarse sanding block works best for this; it's a bit slow, but there's no danger of the tool digging in and ruining all your work.

The final steps are finish-sanding the spinner with medium and fine emery cloth or the like, then removing it from the drill chuck, cutting off the protruding end of the tube, and filing flat the spinner's end surface.

Actually, this isn't really a lengthy project. It's more complicated to describe than to do, and from start to finish, it's less than an hour's work. The completed spinner takes the place of the aluminum spinner furnished with Cox engines such

(Continued on page 59)



(which is all you can use in an under-wing recess) isn't strong enough.

Although I haven't tried it myself, it seems that a drop-off cradle could be made rather easily to facilitate the hand-launching of hard-to-grip models. I have in mind a foam-plastic holder that would firmly support the model in a shaped cutout that snugly fits its lower wing center section. Underneath would be a substantial hand-hold for launching. You could toss the whole assembly into the air, and, as the model began flying, the cradle would drop away. Wheeled "dollies" working on just this principle have been used successfully for many years to launch U-Control speed models. (*Editor's note: They are still being used in England for many of the current ducted-fan designs.*)

treacherous; fixing them usually means adding enough nose weight to bring the CG forward to where it belongs.

The best material for nose ballast is lead, or a lead alloy, e.g., type metal or wheel-weight alloy. These are all high in lead content, and thus provide maximum weight in a minimum volume. On a small R/C model, this is important. Solder isn't very good balancing weight, because approximately half of it is tin, which is a rather light metal. Many tire dealers and service stations will give you used automobile wheel weights, and they're easily melted down. Lead-melting ladles are inexpensive and not difficult to find, and using a ladle is far safer than using, say, an empty tuna can for melting and pouring lead ballast.

The best place to add nose weight is as

IN THE PAST, R/C plane enthusiasts were primarily model builders, taking a lot of pride in their creations, whether from kits, plans or scratch-built from their own designs. Flying was also important, of course, but a modeler was most admired by his peers for the high quality or ingenuity of his model.

Though many don't like to admit it, our hobby has been changing; radio con-

Latest EZ war-bird is a colorful, super-flying model—one of the series' best yet!

trol now encompasses the major part of sport model activity. True, classic, stick-and-glue-type model builders are becoming rarer, and it's becoming more of a model-flying hobby.

In a few cases, the lack of time or interest in model building has led to modelers making a living by custom-building models for others. To satisfy modelers who have limited time to devote to model building, a new type of model kit has been developed—the ARF, or almost-ready-to-fly model. It isn't a new concept; 25 years ago, Len Purdy created Lanier Models* and the first series of successful production-type ARF R/C models. They have vacu-formed fuselages with sheet plastic-covered foam wings and tails, and they're still in production.

The newest breed of ARF models is just about all imported and is very impressive. The new kits are very complete, the planes fly extremely well, and their appearance is outstanding. The scale models offered have fairly accurate outlines with beautiful color and marking detail.

In my opinion, Hobby Shack's* EZ series of imported ARFs is the finest. I've flown all the planes in its War Birds series (the P-51, FW-190



H O B B Y S H A C K

EZ

PT-19

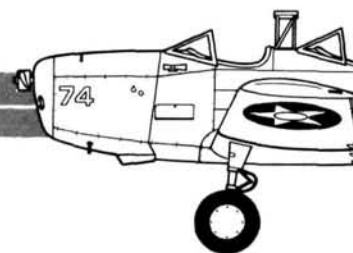
by NICK ZIROLI

and Zero) and have been amazed by their good looks and performance.

Having test-flown about a dozen new-generation ARFs, I became curious about building one. While discussing construction techniques with MAN Editor Rich Uravitch, who has built a number of them, he offered me the opportunity to find out first-hand. He had just received the EZ Fairchild PT-19 and needed it prepared for this issue. Would I like to do an evaluation of this kit from an experienced modeler's point of view? Sure; I was traveling a lot, and this would give me something to build "on the road," and it wouldn't generate the usual model-building mess. (It also requires a minimum of tools.)

I was favorably impressed by the whole package, from the box right through to the

PT-19



finished product. All the parts are packed in plastic bags, including the wing panels and the fuselage, and *everything* you need to assemble the model is there. Aside from adhesives, engine, prop and radio system, it's all in the box. Of course, a few hand tools are required to complete it.

ASSEMBLY: At first glance, the 14-page construction guide appears to be very complete, with many photos and drawings. It's much better than most, but it's a little vague in

front rib includes a vertical mounting tab that was easily oriented along the bottom surface of the wing. It's pictured clearly enough the correct way (sticking out above the leading edge), but, instinctively, I nearly installed it in reverse.

Type: ARF/Sport Scale
Wingspan: 62¾ inches
Weight: 102 ounces
(6¼ pounds)

Vacu-formed plastic covers are glued into place over the center-section top and bottom with a CA like Zap*. This is where I had my biggest problem: I couldn't keep the CA from places I didn't want it, i.e., on the outside of the joint. Once CA touches the surface of the plastic, it's marred, as CA immediately attacks it. No matter how careful I was, I still didn't eliminate the problem completely. However, carefully scraping off the excess with a razor blade, sanding the area with wet No. 600 paper and then polishing with compound helped to restore the surface.

Landing gear, aileron servo and pushrods complete the wing. To dress up the wire struts, plastic landing-gear strut fairings are included. You're instructed to simply glue the two halves together over the strut, but I added RTV silicone rubber inside the top and bottom of the fairing to hold them securely, yet give some flexibility.

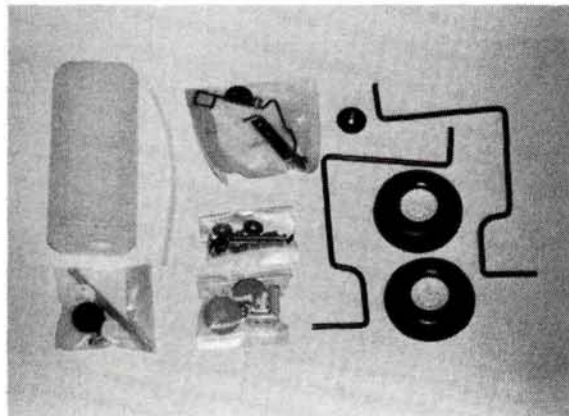
Completing the basic fuselage requires epoxying the wing-mount block and the servo mount and gluing the vacu-formed pre-trimmed fillets into place. The fact that almost all the formed plastic parts are trimmed to a perfect shape is noteworthy. Color match is also better than I've seen before between the printed sheet foam and vacu-formed parts (almost perfect for the blue). About the only thing I'd like to see added to the vacu-formed parts list would be a pair of pilot figures. These would



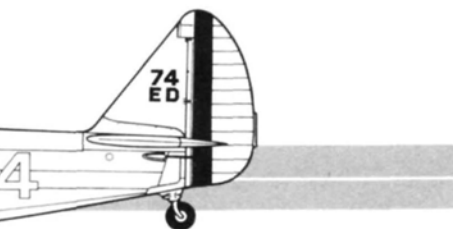
Team Zioli—Nick and Nick Jr.—prepare the Cornell for its first hop. Both were equally impressed!

some areas, and these should be discussed in more detail.

Both wing panels come 100-percent complete, and need only be joined. Three plywood joiners must be epoxied together for joining at the main spar. Front and rear center ribs are epoxied into the panels when they're joined; be careful, as they could easily be installed upside-down. The



Far Left: No need to buy things like fuel tank, wheels and hinges—they're all included. Do buy a couple of pilot figures, though!
Left: Most of the airframe components, right out of the box. Pre-decorated, permanent color.



Wing Area: 612 square inches
Wing Loading: 24 ounces per square foot
Power Required: 40-45 2-cycle; 60-90 4-cycle

Number of Channels Required: 4

Suggested Retail Price: \$320

Features: Pre-formed, pre-decorated airframe with vacuum-formed fairings and accessories. Complete hardware package, including fuel tank, wheels, hinges and control linkages, is provided.

Comments: An attractive, colorful new entry to the growing list of ARF scale airplanes. Due to unique construction, repairability may present problems. Excellent flying airplane, very scale-like when properly powered.

add a nice touch.

Drilling the wing-mount bolt holes through the wing is a game of chance, as described, because it's difficult to measure and drill accurately. I screwed the mounting bolts into the fuselage just far enough for the wing to hit them when it was correctly in place, square to the fuselage center line. A piece of masking tape on the wing and fuselage gives something to mark index lines on so it can be relocated correctly. A dab of chalk or light-color paint on each screw head and reassembly will leave marks at the proper drilling points. Clever features are the small O-rings that are placed over the wing-mount screws to keep them from falling out of the wing when it's not on the fuselage.

The aluminum engine mount is very well done. It will accept any engine that one would install in the PT-19. I chose a Como 40 for power, since I had a number of them left after our crash-and-burn movie scenes described in the March '88 issue of *MAN*. We used eight of these engines, and they all ran perfectly, right out of the box. In most cases, the first time we ran one, we flew it.

The only metalwork required, other than cutting pushrods to length, is drilling four holes in the engine-mount plate

(Continued on page 36)

CARBON FIBRE TAPE

No matter how much time and effort you spend building a model, its lifespan will probably be shorter than you hoped for. Many of today's Almost Ready to Cover, Almost Ready to Fly, Ready to Fly, and even the traditional Ready to build kits are not as strong as they could be.

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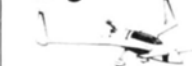


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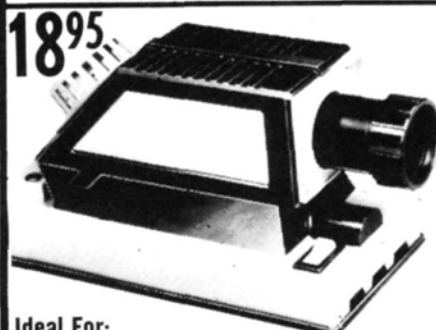
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SPECIFICATIONS:

Wing Span 62½ inches
Wing Area 770 square inches
Engine Size 10 cc
90 or 120 four stroke

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XLT

SPECIFICATIONS:

Wing Span 65 inches
Length 65 inches
Wing Area 845 square inches
Recommended Engine Size 10 cc
90, or 120 four stroke

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Wing Span 63¾ inches
Wing Area 700 square inches
Engine Size .50-.60 (Glow)
.90 four stroke

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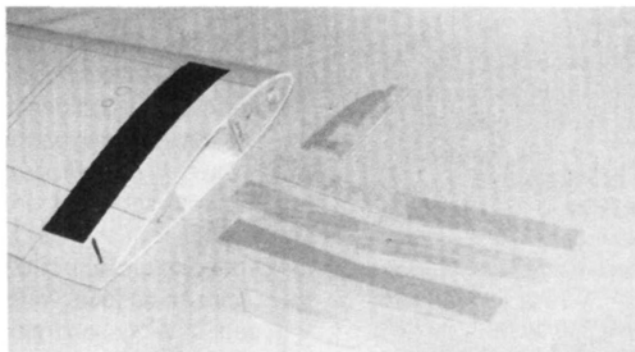
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PT-19

"... Some may not like ARFs, but they're changing the look of our hobby!..."



Hefty wing-panel joining system includes die-cut ply and balsa spars, ribs. All parts fit nicely.

to suit your engine. It will accept sizes from a .40 2-cycle to a .90 4-cycle. A fuel tank is included, and a place for it is provided in the fuselage where it's secured with RTV.

The cowl is two vacu-formed pieces that come trimmed to size and only require gluing together with CA—*carefully!* Aluminum brackets and plastic fasteners secure the cowl. I locked the brackets into place inside the cowl and epoxied them to the fire wall as an assembly. When the epoxy had cured, I removed the cowl and secured the brackets with screws. Fitting any standard muffler inside the cowl of an EZ model requires cutting large, unsightly holes to clear it. I used a Tatone* manifold and it fit without any cutting. An extension tube diverts the exhaust out through the bottom of the cowl and also reduces the noise level. This mounts nicely to the Como 40 without the use of straps. Two No. 6-32 screws replace the stock muffler ones. Position the manifold and spot-drill locating marks through the mounting bosses on the engine. Drill and tap the manifold and attach it to the engine using RTV to seal and help secure it.

The stabilizer elevator assembly comes complete and only requires epoxying to the fuselage, followed by the fin and plastic root cover. (Accurate alignment is stressed and well-described.) After installing the tail wheel and epoxying the rudder hinges, only the control system and details are left. A plastic cap is included, and this fits

between the tail-wheel mount and the fuselage. (This isn't mentioned or described anywhere, but it's easy to figure out.)

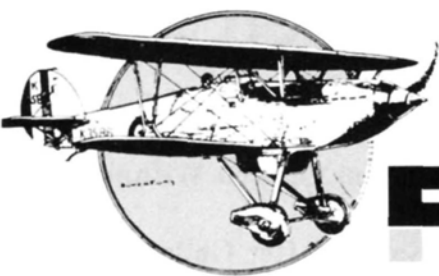
A vacu-formed rudder trailing-edge cap is included to protect the trailing edge from being dented. This is very nice, but it's yellow, and would ruin the plane's appearance if it wasn't painted. I decided *not* to use it, and instead coated the raw foam edge with five-minute epoxy and then joined the red stripes with paint. It looks good and, with care, will last. This cap should have been made *clear*. The only other marking I made was extending the panel lines on the wing over the ailerons with a Staedtler Lumocolor 313 marking pen.

All pushrods and links are included. Installation instructions are clear, but the lack of exit holes or marks for their location made things a little difficult. The servo mounts are a rather soft ⅛-inch plywood. Instead of putting mounting screws into a single layer, I epoxied a ½-inch-wide strip of scrap plywood under each side of the mounting plate for more screw bite. The aileron mount was also installed in this way.

Recommended control throws were used, and these proved to be about right. The addition of a brass AMA prop nut put the balance point as indicated in the instructions; with a larger engine, the PT-19 might not require additional weight.

PERFORMANCE: The flight instructions make flying seem easier than it

(Continued on page 60)



Fifty Years Ago..

by STEVE POND



BACK IN THE LATE '30s, when aviation technology was progressing at an unprecedented rate, many considered air superiority to be one of the most important goals of the armed services. Whoever controlled the skies could, in no uncertain terms, conquer the world.

An article called "Hidden Wings of The Army" by Douglas J. Ingells in the February 1939 issue of Model Airplane News elaborated on how America was making its bid for a controlling share of air space. One of the strengths of the American winged warriors (apart from a plethora of new technology) was the potential size of their fleets. The American air defense wasn't yet the largest in the world, but it planned to be.

Should the need arise, it was within the realm of possibility for American aircraft manufacturers to convert many commercial aircraft to military use. Even one of the mightiest bombers, the Boeing Flying Fortress, without her nose blister, bore an incredible likeness to the Skyliner. The Douglas Bomber strikingly resembled the Douglas DC-3, which was used as a transport plane for the commercial airlines. Even a Waco biplane, originally designed for use as a sport aircraft, was equipped with a rack of five 20-pound

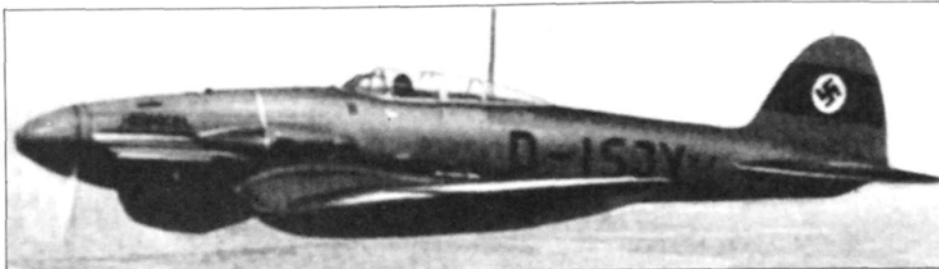
demolition bombs, while the rear seat held a .50-caliber Browning machine gun capable of belching out 1200 rounds per minute. The cockpits of this breed of Waco were also indicators that these planes were no longer bound for civilian

tankers for in-flight refueling.

Elsewhere on the frontiers of aviation, there were a number of specialized military aircraft being built as the realities of the war in Europe drifted west. Some of the new military machines included the



The formidable Boeing B-17 bomber, better known as the "Flying Fortress," could be converted from a Stratoliner with the addition of a nose blister and some other wartime accessories.



One of the hottest, newest, German planes during this period was the Heinkel He. 112, which was a single-place fighter and was reported to be powered by two 650hp Junkers engines.

airports. Located on their instrument panels were markings showing the locations of bomb-release levers and a machine-gun trigger on the stick.

What made these aircraft conversions possible was the fact that America was the largest manufacturer of civilian and commercial aircraft. Use of the technology already available made production of military aircraft considerably more cost-effective as well as timesaving. Even today, as the largest manufacturer of commercial aircraft, the United States is still using commercially developed technology to support its military program. Aircraft such as the Boeing 707 and McDonnell Douglas DC-10 are now employed by the military as the KC135 Stratotanker and the KC10 Extender respectively. These craft are used as

awesome Curtiss XP-40 pursuit plane. This immediate predecessor of the P-40 Warhawk was considered to be the most indomitable air weapon in grand old Sam's ranks, with its top speed of 400mph produced by new, streamlined, in-line engines manufactured by Allison. The Allison engine used to power the XP-40 was a GV-1760-DI, which developed 1620 horsepower. Each of the XP-40's wings was equipped with Browning .50-caliber machine guns, and both the engine and the machine guns had Prestone liquid cooling to "keep things cool under fire".

The XP-40 was developed from the Curtiss Model 75 single-seat pursuit plane, and, with a few refinements, it was later designated the XP-37. After the XP-37, engineers at Curtiss decided to



A direct descendant of the XP-37 and "father" of the P-40 Warhawk, the XP-40 pictured here was the most intrepid airborne warrior of its time.

abandon the exhaust-driven General Electric centrifugal supercharger (a rather long-winded way of saying "turbo-charger"), redesign the cooling system and move the cockpit forward to the mid-point of the fuselage.

Other significant developments at this time included the German Heinkel He.112 single-place fighter that was powered with two 650hp Junkers engines, and the Heinkel He.111 bomber was also impressive. This four-place bomber was super-streamlined to obtain the fastest possible speeds, and, with the power of two 910hp engines behind it, it was easy to see why it could travel at over 300mph.

In modeling, the interest in gas models continued to grow, as modelers saw more and more models actually looking like full-scale planes. One of the new trends was the building and flying of gas-powered scale models. Until then, gas models had just been miniature flying machines that didn't attempt to emulate actual aircraft. But now, modelers were able to build scale models that would accommodate a gas engine for free flight. Scale gas-powered kits were also offered by a few manufacturers with enough

and, according to reputable sources, would develop 10 to 12 pounds of thrust. This issue reported the first time anyone had attempted to attach one of these engines to a model (a modified Super Buccaneer built by Walter Tinsley). Although, at the time of printing, the craft hadn't been flown, static tests with the engine running full bore indicated that the airframe would be able to handle the stress.

Along with the increasing diversity that model airplane flying was experiencing, there arose yet another segment of the gas-powered market. Gas-powered



Another developing trend in gas modeling during the late 30s was gas-car racing. These cars were either guided by a tether string or run "free flight."

car racing, which at this time was also "free flight," was riding the crest of the gas-power wave with what were roughly 1/8-scale asphalt-racing cars similar to those seen at the Indianapolis 500 (then in its 27th year) and other races. These cars, e.g., the Speed Demon from the Bunch Model Airplane Co. and the Mercury Midget from Reginald Denny Enterprises, resembled full-scale cars in that they were constructed with aluminum frames, and had pneumatic tires, aluminum bodies and, of course, gas engines. To run, the cars were either attached to a control line or run free on a straightaway at speeds of up to 55mph.

Regardless of whether you liked your fun in the air, on the ground, or on the water, modeling in the '30s had something to offer everyone. ■



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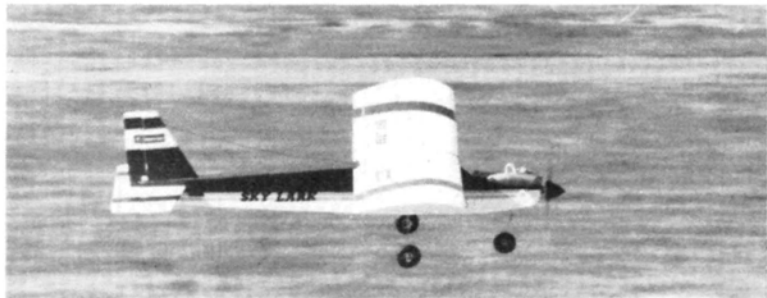
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One of the first radial engines ever seen on a flying model airplane was this Forster Brothers 3-cylinder radial attached to Walter Tinsley's Super Buccaneer.

insight to see this trend in its embryonic stage. Another interesting piece in the Feb. '39 Model Airplane News (although it may seem trivial to some of you now) was news of the development of the three-cylinder, radial, gas model engine. Designed by the Forster Brothers, this engine developed about 1/3 horsepower,

CASTING NOSE WEIGHTS



CUSTOM-FIT CG CONTROL PUTS THE WEIGHT IN THE BEST PLACE.

NOTHING IS MORE disappointing than finishing a model and hoisting it onto the balance poles, only to find that the CG is off by a city block. If it *is* off, it's almost always too far aft because we may have worked a little too hard to build up a finish, or we didn't do our homework when selecting balsa or limiting glue squeeze-out.

Once the batteries, receiver, mini-cam, portable toilet, etc., have been shoved

it gives the maximum moment arm. Unfortunately, space-age spinners aren't found in most R/Cer's toolboxes.

If custom-made spinners are out of the question, the next-best solution is to bolt weight on the motor mount as far forward as possible. Yes, it can be bolted to the fire wall, but that gives up at least 2 inches of moment arm, so the final weight will be higher.

The biggest problem is coming up with

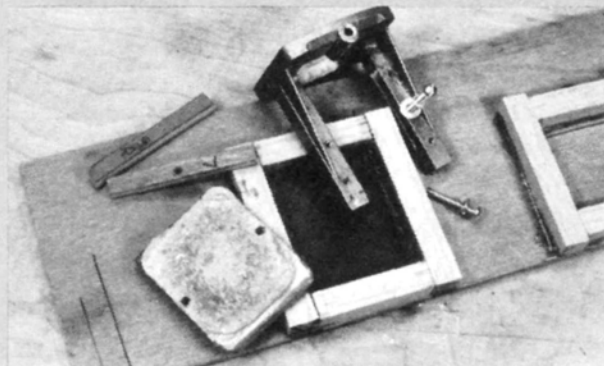
different weights should last a modeler a lifetime, unless he's habitually hanging cast-iron tails on his models!

With the airplane on the balance poles, start stacking tire weights on the engine. Remember to stack the weights on the engine centrally where you plan to hang the final weight. If you're using a big weight (in the 10-ounce range), it will probably be centered right under the engine because of its size. So, the weights should be stacked on the head.

If it's possible to move the weight forward on the beams, use a piece of wire to hang the weights in their approximate location. Neither the weight nor the loca-



Basic ingredients for casting weights: a simple wooden form and some discarded car-wheel weights available at your local service station.



In this case, the wooden form was sized to allow attachment of the casting directly to the engine mount.

forward against the fire wall, we have to face the inevitable: Weight must be added in the nose. It's a bummer to have to lug around unnecessary weight, but sometimes it's unavoidable.

Since you want to add as little weight as possible, remember that the further forward the weight is placed, the less will be needed. If you were really bucks up or had access to NASA's prototype shop, you could machine spinners of various weights, which would allow the least amount of total weight build-up, because

the correct weight. Where do you find a weight that's the right size to balance the model and will bolt to the motor-mount beams? Simple: Cast it yourself! Casting weights may sound intimidating to some, but it's really very simple.

The automotive industry has saved us lot of grief in the CG-control department by providing tire weights. Every filling station worthy of its name has a bucket of used tire weights and will give you a cupful. Tire weights vary from a fraction of an ounce up to 3 ounces, and a cup of

tion has to be exact, because extra weight will be added when casting, and then later removed for a precise CG.

To estimate the final size of the weight to be cast, use the following rule of thumb: A pound of lead is approximately $\frac{1}{2}$ inch thick when it covers the bottom of the mount beams for a .40-size mount. With the weights, balance the airplane slightly nose-down, then add an extra $\frac{1}{2}$ ounce to account for the rim clips, which will be removed when melting.

Building the mold is so easy, you won't

believe it. Molten lead cools so quickly that a wooden mold is only slightly charred by it, and this makes it possible to make weights in any shape, simply by making a wooden mold in the desired shape. Small weights can be made by drilling holes in wood, or by carving grooves of the shape needed. For a motor-mount weight, the mold is a simple box.

Make the box mold the width of the inside of the webs on the bottom of the motor mount. The length of the mold depends on your requirements. Make a guess; if it's wrong, it's easy to correct. But remember to move the weight *forward*. It's better to have a short, thick weight up front, than a long, thin one that covers the mount because of the longer moment arm. The mold is simply a box made of nape motor-mount material on a ply-

so gaps aren't anything to worry about. Glue the mold together with CA and fillet the inside edges with thick CA. Incidentally, if it takes more than 10 minutes to make the mold, you're trying too hard. It doesn't have to be perfect!

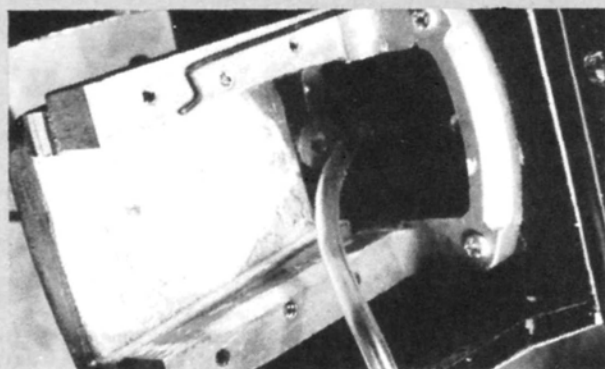
When melting lead, remember to wear eye protection and heavy-duty gloves. You should also wear a mask to avoid inhaling any fumes. The lead can be melted in just about anything that's reasonably stout, although a lead ladle is preferable, because it holds heat well and has a long handle. (Mine came from a garage sale for a buck.) An old saucepan will work (repeat, *old*), but it should be iron, not aluminum.

Add the weights to the melting vessel one at a time, and play a propane torch on them until they melt. As each one begins to melt, remove the rim clip with a pair of

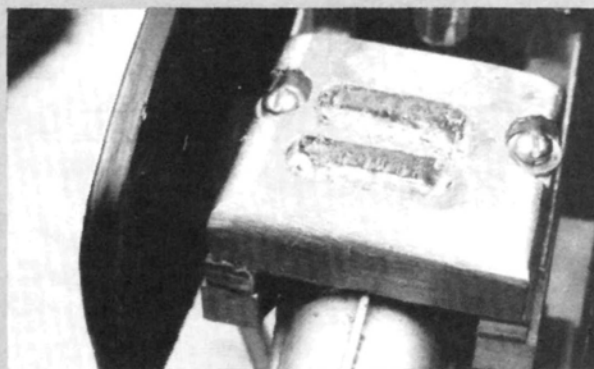
ingot, so you may have to pour the ingot twice, if you don't like the appearance of the first. The second time, the lead will flow into the mold smoothly and produce a perfectly square, shiny brick.

Drill the mount beams in preparation for tapping a 6-32 screw. When the raw holes are still untapped, clamp the weight onto the bottom of the mount and spot-drill it through the holes to be sure they match. If the weight will be under the engine's case, it will probably need a spacer to clear. Strips of aircraft plywood work fine for that application, but don't yield to the temptation to stack up washers for a spacer. The weight won't be stable enough with only one screw in each side and a stack of washers, so use a full-length piece of plywood.

Mount the weight and put the airplane back on the balance poles; it should be



Attached to the mount, the casting puts the weight in its most efficient location.



The CG (balance point) can even be "fine-tuned" by removing small amounts of lead from the casting.

wood base. Hardwood works better because it doesn't char, but it isn't absolutely necessary. Use whatever is handy, but try to avoid pine, and definitely don't use any pressure-treated wood, because it contains toxic compounds. Use $\frac{1}{8}$ or heavier modeling plywood for the base, but again, this isn't critical.

When fitting the pieces of the motor mount together for the sides of the box, try to avoid gaps, but you don't have to make a major project out of it. The lead is so thick that it won't run into small gaps,

pliers. When all the weights have melted, there will be a film on the top of the molten puddle. Use a dowel, pencil or screwdriver to scrape off this slag, leaving a clean, bright puddle.

Carefully and *slowly* pour the lead into the mold. If there's any moisture in the wood (and there's bound to be some), the heat will produce steam, and this will cause the puddle to bubble. Pour slowly so the steam build-up doesn't cause splatters. Usually, the bubbling will leave a slightly irregular surface on the resulting

nose-heavy. Remove the weight and saw off what appears to be about half the amount needed from the back of the weight and remount it. Fine-tune the CG by using a $\frac{1}{2}$ -inch drill bit to make a series of spot-drills on the bottom of the ingot.

There, told you it was simple! With any luck, you'll never need to cast one of these beauties, but, if you do, you can do so with confidence. ■



England's "Grandfather of the Helicopter" visits the colonies

MAN
TALKS
WITH

LEN MOUNT

by TIM DEPERI



Photos by Ron Forkas

Above Left: Rich Zachari (left) and Len Mount compare notes on their X-Cell and Schluter Champion machines. Above: A tip of the hat—provides a pretty clear indication of Len's confidence in both himself and his machine.

ON SEPTEMBER 24, 1988, my good friend Rich Zachari called me and said that he and Len Mount were ready to go flying! Within an hour, I was at Rich's house for a great weekend of flying with Len Mount, who is affectionately known in England as "the Grandfather of Helicopters." Other than heli buffs, most modelers won't recognize his name; however, he's one of the best heli pilots in the world, and one of the nicest guys I've ever had the pleasure of flying with!

Len spent a few days in New York City, and along with taking in the sights, he spent the weekend at the HELI (Helicopter Enthusiasts of Long Island) field, one of the largest helicopter clubs on the East Coast. (I'm president of the Club.) I had a chance to talk with him, and here's part of our conversation:

Tim: Len, how long have

you been flying?

Len: *Approximately 20 years. I started with my own design, and it didn't fly. In 1972, when Schluter brought out his first commercial heli, the Huey Cobra, we found that it didn't fly either. We were disappointed, because we thought that if you bought a commercial ship, it would do the job. After three or four months, we realized that it wasn't the helicopter that couldn't fly, it was the pilots! So after I'd learned to fly the Cobra, I went back to my old design, and that flew, too. Those were the days when no one knew the right answers.*

Tim: When did you start flying contest circuits?

Len: *Contests took me quite some time. In the early days, I was rather shy, didn't like to go to dances or anything like that, so I used to fly my own helicopter through the forest. I was quite good at it. I couldn't go out in*

public and fly, so I'd go to contests and leave the helicopter in the car. On the way home, I used to think that I could have beaten those guys! Once I got over the fear of appearing in public, I did fine. The way I teach people to get over the fear of flying in public is to tell them to put the helicopter down in the field and then look at the crowd. How many people are looking at them? Very few.

Tim: What do you think of PCM radios for helis?

Len: *I think it's a good idea in an airplane. But in a helicopter, if you fit it to the last command input, it would be fine in an aerobatic competition, because if you're doing a roll, you'll keep rolling, even if you have interference. However, if it was just for fun-flying rolling, you could keep rolling all the way into the crowd or the parking lot. If you have a glitch, you know it. You can have interference with PCM and not*

know it, because you can fly through it. With standard FM, you see a glitch; then you have the choice of either continuing to fly or coming down. I personally like to see a glitch.

Tim: Tell me about some of the machines you've flown.

Len: *I've flown virtually every make and brand on the market, because I like to use all the best features available. You have to keep on top of this thing most of the time. The latest I've flown used many composites, especially in the head. But I'm not a believer in plastic, because you have to dig deep into your pocket. In a crash, a plastic rotor head just breaks. You can't bend plastic back again; you have to buy new stuff, but a metal head can be bent back. So if you can't afford to buy new stuff, at least you can bend the old stuff back into shape.*

Tim: You've discussed the economics, now tell me about

flying.

Len: *The machines are all about the same. Rotation is most critical. There's left-hand and right-hand rotation, you know, and if you're used to one, I don't recommend switching to another.*

Tim: Many of us have heard of Ewald Heim. Are you friends with him?

Len: *Yes, we're friends. In fact, we only shook hands last week. He's been beating me for a long time (he's been beating everybody for a long time), and, last week, I beat him at the European Championships right up to the last point. Then at a fly-off, he beat me by a half a point! We joke about it; there's no animosity, no hate. It's very friendly on the European scene.*

Tim: Len, tell me about your recent victories.

Len: *Since I hadn't been doing well with a machine that wasn't suited to my style of flying, everyone thought I was going to make a fool of myself, but I won both the Scottish and British Nationals. So everyone realizes the machine I have now does suit me. The competition thought I was dead and buried; it's nice to come back from the dead, isn't it?*

Tim: It's common knowl-

edge that the Europeans like high-head rpm. At what speed are you turning?

Len: *I've slowed myself down a bit. About three or four years ago, I did between 2000 and 2200rpm and I liked it. But you don't have many friends at that speed, because they all walk away from you; that's another reason why I don't like plastic rotor heads, but now I'm down to 1600rpm.*

Tim: Can you tell me your feelings about a full-time tail rotor in an autorotation?

Len: *I've seen it in England; Vago Nordigan used it. I honestly couldn't see the need for it on a calm day, or when the wind was blowing along the course. But it's vital if you have to fly crosswind. In the European Championships, it was purely 90-degree crosswind, and everyone who didn't use tail drive turned into the wind and lost points, including me. Everybody who had a tail drive (full time) ended up the right way (on the pad), so I've now changed my mind.*

Tim: Would you do that for a fun-flying helicopter?

Len: *No, keep it simple, because if you're learning autorotation, you should keep as much power in the head as possible, and*

tail drives do suck power.

Tim: Tell me a little about your trip across the English Channel.

Len: *About four years ago, a friend and I were crossing the Channel by ferry after a big indoor demonstration. My friend said, "Wouldn't it be great to fly a model helicopter across this?" I told him to arrange the full-size machine, and that I'd arrange the models. Nothing was done for another two years. Then, one day, he phoned me, and I told him I was waiting for the competition season to start. We started talking about the Channel crossing and decided to go for it. I then built two machines. They each had to weigh under 11 pounds, including the fuel. We had stuff on the machine made of magnesium alloy, titanium, and other light materials. Each helicopter cost us about \$3,000, just for the engines to die, and to say "Cheerio" and watch them go into the drink! Those damn things don't float, so I got special fuel tanks, and my wife made the light fuselages. The rotor blades were very thin and light, too, but they did the job. I wasn't planning on pulling any Gs or doing any aerobatics with them.*

My friend Jeff organized two full-size helicopters for the cross-

ing: two Aerospatiale Ecuriel (Squirrels), or "Astar" in the States. We needed two: one for us, and one for the photographers and the TV crew.

For some reason, we weren't allowed to take off from England. We wanted to do a return flight, but the British Customs authorities said that we couldn't take off from the English side. The trip was supposed to be from England to France, and then back, but we could fly from France to England only.

For this trip, a full-size glider club gave us permission to land at its airfield about three miles inland, and about 24 miles from the Channel.

When we took off, there was a 45mph headwind, but we knew we could do 80mph. We had more than 15 knots to get there with the amount of fuel we had. After 6 minutes of flight, we never went more than 10 to 12 knots. The helicopter was being buffeted around so much that it should have broken up. The final straw came when the model dropped its nose vertically under the full-size machine. When it had happened three times, I'd had enough. We were also advised by the pilot of the full-sized heli that we'd only make one third of the entire trip.

(Continued on page 65)



Above: Some of the members of the HELI club with their helis. Very active club, great bunch of guys.

Left: Len's visit to the HELI club field was well received by members and invited spectators.



Left: Jack Denis of Anaheim, CA, built this extra-large Corbin from plans that appeared in a 1935 aviation magazine. Flies on a 4.2 Sachs engine with GH ignition. Model weighs 53 pounds.

Below: Chuck Fuller (left) and helper tweak Chuck's AT-6 Texan prior to a flight over the desert.



GIANT STEPS SPECIAL

by DICK PHILLIPS

F U N

1988
QSAA

F L Y

OF ALL THE MODELING events held each year, the one that attracts the most wide-ranging attention is the Quarter Scale Association of America (QSAA) Rally in Las Vegas, NV. Participants come from many foreign countries, most of the states and many Canadian provinces. The 1988 event (October 27-30) was no exception, and modelers displayed a wide variety of well-built and well-flown models.

The event was founded by Eddie Morgan of Las Vegas, who began building large models in the mid '50s and was responsible for getting a group of like-minded individuals together on a dry lake bed near Las Vegas in 1977. Ed Morgan passed away on October 16 after a short illness, and the QSAA Rally '88 was dedicated to the memory of the man who got things started 12 years ago.

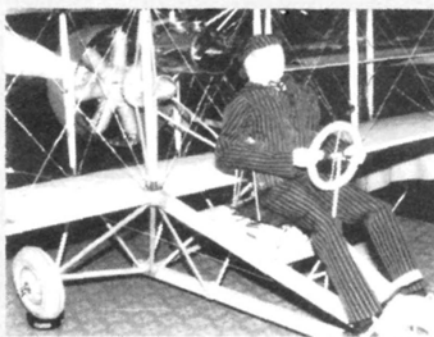
Ed Morgan was a small, quiet, unassuming man with a big heart. In the years I knew him, he never had a harsh word to say, always had time to help others and to listen to anyone who wanted his ear. I think I knew Eddie fairly well, and he was one of the nicest people I've known. He'll

(Continued on page 48)

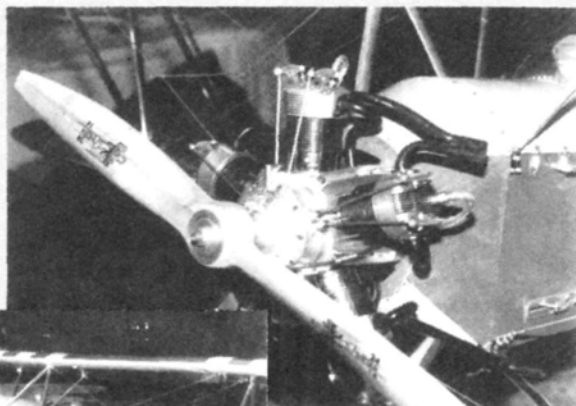


Jet-powered Compass Cope-type model built by Phoenix group. Model was surprisingly quiet. Engine may eventually be marketed, although plans are as yet unfinalized.

Right: C-5B by Bill Hempel. A very impressive model both on the ground and in the air.



Left: Mel Barber's Beachey Looper on display at the Showboat Sports Pavilion. All fittings and turnbuckles were made by Barber. The wheel under the pilot figure's feet contains water ballast to balance the model. Below: Interior of Jim Heeswick's Jodel indicates the pains taken by this capable builder.



Above: Another of Forest Edward's radial engines, this time, on a Polikarpov biplane trainer. Great workmanship in both engine and model.



Above: Full view of Polikarpov built by John O'Brien. Originally an RCM plan at $\frac{1}{6}$ scale, the plan was enlarged to produce this 114-inch-span model weighing 31 pounds.



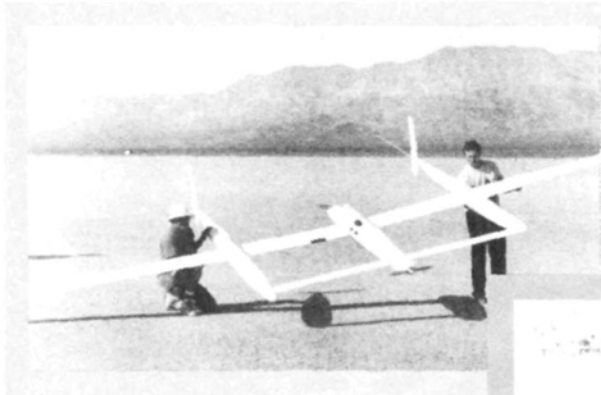
Above: Noel Hess' Waco, which won "Best Finish" trophy. Hess' superb workmanship shows in all his models.



Above: Jim Heeswick's Jodel R-12; 108-inch span, 32 pounds, Zenoah G-62 engine. Beautifully detailed.



Above: Flight shot of Addie Naccarato's electric-powered B-36. Model flew extremely well and was most impressive in the air.



Left: Builders show off their static model of the Rutan Voyager. Model was built to test ideas and structures. A second, and possibly third, model will be built for flight. Below: Everybody's favorite couple: Hazel Sig-Hester and Maxey Hester with their Spacewalker models behind them.



always be missed in Las Vegas and elsewhere, and it's fitting that the 1988 event was dedicated to his memory.

Despite Ed's absence, the 1988 Rally was a resounding success. In 1987, the event was rained out after the first day—unusual for Las Vegas. This October was a hot one in Nevada. Temperatures averaged 10 degrees above normal, and the dry lake bed used as a flight center was hot and dry. The event began on Thursday with a display at the headquarters hotel, the Showboat, which has done a great job of catering to the QSAA and its guests for several years. The sports pavilion turned into a giant "show and tell" for the day, and modelers and suppliers spent the day exchanging ideas and showing their wares.

While the Rally isn't a competitive flying event, the models are evaluated by the builders and pilots who attend, and a variety of trophies is awarded. Those eligible are encouraged to submit their ballots, and this made for a wide-ranging, representative sample of opinions—it's probably also the largest "judging" panel anywhere! Those who take home a trophy have the approval of their peers, and that has to be a good way to determine the best in a variety of categories. While such judging is rather subjective, the large number of participants eliminates any bias that might be present in a smaller panel, the members of which might be allowed to confer over their selections.

Among the superb models present, several stood out above the crowd. Not least among them was a 27-foot-span static-display model of the Rutan Voyager that recently flew non-stop around the world. This outstanding creation was put together by Paul Ross and Don Westergren of San Diego. I think these are the two who put together the Space Shuttle and 747 models over the past year or so. The Voyager model emulates the original aircraft in structure and form, and, when handled by its builders, it

showed great flexibility. The model displayed in Las Vegas is being used to test the techniques that will eventually be used on the radio-control model. Is there, perhaps, a world record for models somewhere in its future? Too soon to tell, but if the performance of the original is any indication, who knows what may lie in the future of this amazing construction?

of a successful, amazingly quiet, true jet engine in model size was an amazing sight that caught the attention and earned the approval of all present. The engine produces a maximum of 15 pounds thrust, is throttle controlled and flies easily on 7 pounds of thrust. While no plans or prices were announced, it was stated that the model jet engine will be produced and marketed in the near future. I guess that the engine will sell for several thousand dollars when it does reach the market, and I've no doubt there will be eager buyers lining up to be the first on their block with a *true* jet engine.

This exciting design was developed by a Phoenix-based team: Bryan Seeger is responsible for the engine itself, Bob Wahl developed the electronics and the fuel system, and Jim Allen designed and flew the airframe. The model is of a Compass/Cope pilotless drone; not much for looks, but it certainly performed

1988 QSAA STANDINGS

Category	Winner	Model
Multi-Engine Award	Bill Hempel	C5-B
Best Biplane	Bill O'Brien	Polikarpov
Best WW I	Jim Doakus	Sopwith Pup
Best Finish	Noel Hess	Waco
Best Scale	Claude McCulloch	Rawdin T-1
Best Military	Stan Stauffel	P-47
Best Stand-Off Scale	Russ Truby	1/3-scale J-3
Best Mechanical		
Achievement	Jim Allen	Compass/Cope
Powder Puff	Ruth Sharp	Tomahawk
Junior Achievement	Heather Wright	Fly Baby Biplane
Best Scratch-Built	Joan Krone	Kinner Sportwing
Best Static	Paul Ross	Voyager
Best Civil	Jerry Van Heeswick	Emeraude
Best Electric	Addie Naccarato	B-36
Best Ultralight	Tony Naccarato	Ritz Model A
Best Jet	Dennis Crooks	SR-71
Best Glider	Jim Metzger	Grobe G-109B
Marathon of Flight	Ken Meede	50 Miles
Longest Distance Traveled		
to Attend	Mel Barber	South Africa
Best of Show	Mel Barber	Beachey Looper

I doubt that anyone knows where the first public display of true radio control took place, but it was a considerable thrill to have seen *another* significant advance in model airplane flight: The presentation

flawlessly. The most amazing aspect of the model was its lack of noise. It was as quiet as, if not quieter than, many of the reciprocating engines flown on the desert.

(Continued on page 94)

Sporty Scale Techni

by FRANK TIANO

THIS MONTH, I'll talk about an event, a couple of tools, a book and your attitude! First, I was astounded by the number of phone calls we received after the publication of the first announcement about the new "Top Gun Invitational" in the December issue! I simply never realized how stimulating MAN's color presentation would be. With this in mind, I'll attempt to answer the most frequently asked questions with the following answers. (To all you intelligent, resourceful and anticipatory readers, the questions will be obvious!)

- No, this contest, much like the Tournament of Champions, is open to AMA members who've been invited.
- Do better.
- Somewhere over 40, but no more than 52 from all over North America.
- Arrival day is Thursday, April 20, 1989; Static judging will be on Friday, April 21, and flying takes all Saturday and part of Sunday.
- Everything from sausage and peppers, pizza and ribs to the old favorites—hot dogs and hamburgers.
- No. Instead, there will be a dinner/dance featuring an awards presentation and music. Yes, but very short ones.
- Yes, most will stay at the Westin



Power Lock Sander kit includes disc holder and 15 discs. Fits Dremel tool as shown, plus other similar units.



New Dremel "Free Wheeler" tool is battery operated and rechargeable. Accepts all standard bits and its portability can be useful.

Cypress Creek Hotel. Special rates for any night during the week are available by calling toll-free, 1-800-228-3000. This is a first-class hotel, and I recommend that you make reservations *early*. Dinner tickets are available in advance by calling (305) 473-2211. Yes, we accept plastic.

- No, all types of aircraft will compete. It's just the "Top Gun" of scale competition.
- The last I heard, yes!
- Four rounds
- Plenty of stuff we should really enjoy. Demonstrations by Bob Violett and his ducted-fan crew, Bob Parkinson and his group, U-control combat, model rocketry demos and a *real surprise guest*.
- Fort Lauderdale Airport is the closest. The hotel is about 20 minutes from the airport, the field about 15 minutes from the hotel. (A stamped, self-addressed envelope sent to Frank Tiano Enterprises* will get you a map and set of directions, if needed.)
- 500 feet long and 50 feet wide, with an adjacent grass strip for early aircraft
- Only short ones
- A huge tent
- I think the local club or the Jaycees will be charging spectators \$1 admission.
- Plenty

- Probably 15,000 to 20,000 each weekend day!
- So far, many have committed, but *Model Airplane News* has put up \$2,500 for 1st place: \$2,000 in cash, and the balance in a special trophy and merchandise.
- No different, but, from what I hear, most are building something completely new.
- Ask Rich Uravitch. He's the Boss!
- I'll answer the important ones as I receive them.
- Not now!

Think Perfect

With that out of the way, I'll talk about something that's very important to scale modelers everywhere: Attitude! That's right; attitude can make you or break you; it can help you produce an outstanding model or an also-ran; it can help you create a "wow" or an "ugh"; and last, but not least, it can affect the appearance of your models.

Now that you think I'm completely off my rocker, let me explain: The attitude I speak of isn't the same as the one you might usually associate with someone's personality. I'm talking about "workshop attitude." Simply stated, the time we spend in our workshop making sure that parts fit properly, that not too much glue has been used, protecting the model's framework from denting and trying to maintain our fidelity to scale, is time well spent. When you bring that new scale ship out to the field, you don't have a second chance to make it better. That first impression is most important, so a little extra time spent in the workshop with a sanding block, or measuring and matching to your 3-view drawing, can mean a lot later.

If you compete, you'd be silly to give up any of the points you *could* have earned while in the comfort of your own shop, simply by making sure everything was perfect before saying "I'm done." And if you're just a sport-scale pilot, wouldn't you rather have an admirable piece of work rather than a so-so? Of course you



Ball-drivers are one of the handiest tools you can have. The hex-ball tip allows you to tighten Allen screws in some inaccessible places.

would, and that's why I say make the extra effort in the shop. Force yourself to build a model that looks good at 15 inches, not just at 15 feet!

British Chips

I received many calls asking why I left out the British color-chip numbers in my first article. I also received a personal thank-you note from the base commander in Ohio where all of you called for your copies of Fed. 595 Color-Chip Manuals. Anyway, if you want really good color renditions for British aircraft, the book to buy is "British Aviation Colours of World War Two." This is available from Historic Aviation* and Zenith Books*. It has a Crown copyright and was first published in 1976 by Hippocrene Books, Madison Ave., New York, NY, ISBN #0-88254-407-1. In addition to diagrams explaining what types of markings were used on which aircraft, this book also gives the dimensions of all markings, written descriptions of where and how the colors were used and a special page containing 32 of the most popular British colors during WW II. Look for this book;

it's well worth the purchase price of somewhere under \$15 and, you know what? It wouldn't hurt to tell them you read about it in good ol' MAN.

Tool Talk

Last, but not least, this month, I'll talk about a couple of tools that I guarantee will make any model builder's life easier—especially those maniacs who build *scale* stuff. First, I've discovered an alternative to the Dremel tool! Close your



Excellent source for your color documentation library; compliment FS 595a.

mouth, fly trap, I'm talking about another type of Dremel tool—the "Free Wheeler." No, it's cheapo, it ain't free, but it is free of wires and plugs. This new model No. 850 tool is completely battery operated and is really handy for any type of routing, drilling or sanding job. It has two speeds (15K and 20K), a key-less chuck and a charging unit. I keep a couple of them right on the workbench and find myself grabbing for the plug-in tool less often. No, this really *can't* replace the regular heavy-duty Dremel, but it sure makes a great addition to your tool inventory. You don't have to go any

(Continued on page 52)

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SPORTY SCALE

further than your favorite hobby shop for this neat new device.

Next, Gager Aircraft Sales* "Power Lock Sander." This is really one tool no modeler should be without. A complete kit costs only \$11.95 and includes a special disc holder and 15 sanding discs (five each of a different grit) for use with your Dremel tool. These discs make short work of most sanding jobs where a heavy rasp is usually used. Best of all, because of the disc's design, there's no center screw to mar your work surface, it won't fly off or tear apart, and it can be used in most 1/4-inch drills, as well. The discs snap on and off of their holder in seconds and last a very long time. The coarse-grit disc sands and shapes microballoon globs into beautiful fillets in no time.

Finally, I'll tell you about a set of ball-drivers I recently purchased. I realize that there are a few choices of ball-drivers available, but I really like these because they come as a complete set. Every size you'll need for modeling is included in the handy pouch offered by Bondhus Corporation. The catalog number is 10632, and the set includes eight sizes: .050, 1/16, 5/64, 3/32, 7/64, 9/64 and 5/32. I bought my driver set from Tower Hobbies*, but I'm told that by now, most hobby shops stock them.

Well, that's it for this month. Next month, I'll show you some building techniques and I'll profile a model or two that I've recently seen on the competition circuit. Remember, if you have a question that you feel should be addressed, or a photo you'd like to share, just send it to me here at MAN. (Remember, we can't return photos.) Until next time, walk with your shoulders pulled back, take big strides, pull that stomach in, flip those shades down, slowly turn your head to the right about 120 degrees and...check your six!

*Here are the addresses pertinent to this article:

Frank Tiano Enterprises, 2460 S.W. 85th Terrace, Davie, FL 33324.

Historic Aviation, 3850 M Coronation Rd., Eagan, MN 55122.

Zenith Books, P.O. Box 1/MN019, Osceola, WI 54020.

Dremel; division of Emerson Electric, 4915 21st St., Racine, WI 53406.

Tower Hobbies, P.O. Box 788, Champaign, IL 61820.

Gager Aircraft Sales, 8425 Auburn Rd., Ft. Wayne, IN 46825. ■

F3E

ELECTRIC
WORLD CHAMPIONSHIPS

by T. MONTAGNA

THIS IS AN ACCOUNT of an event that will affect your R/C airplane hobby more than anything since the advent of the digital proportional system. It's a story about a better way to power an R/C airplane.

If you heard about a new glow engine that could take your R/C airplane vertically out of sight in a few seconds, wouldn't you order one at once? If that engine (and your own flying skills) could enable you to win an R/C Pylon Racing event at the Nats, wouldn't you order two of them? And if you heard about a new aircraft design that *flew demonstrably better* than anything you'd seen, wouldn't you jump for that?

The 1988 St. Louis Electric contest of August 10 to 20 was a shocker for the few spectators who braved the 100-degree heat. The shocks came as each event (and a few *non-events*!) demonstrated the awesome power of electric motors in R/C aircraft. And more shocks came as the spectators witnessed the performance of a new generation of R/C aircraft that are, simply, far better designed than the airplanes we're used to.



R.B. Flockhart of England placed 1st in 7-Cell Duration, here being watched by eventual 2nd-place finisher J.P. Schiltknecht of Switzerland. Mrs. Schiltknecht watches stick technique.

Some Surprises

- In the 7-cell Duration event, several new, simple, and highly aerodynamic German kit airplanes called "Elektro-UHU" climbed almost as fast and held their glides as long as the eventual winners. The winners were epoxyglass and carbon-fiber scratch-built airplanes of incredible performance.
- In the 7-cell F3E event, one of these Elektro-UHUs tied the leader before the UHU's pilot had to catch a plane back to Germany.
- In the F3E Motor Glider event, the power-on climbing time had to be cut to 35 seconds, because the airplanes were no longer visible after more than a 35-second climb!
- In the same event, the aircraft had 8- to 9-foot wings that are

constructed in one piece of epoxyglass, with carbon-fiber spars, ailerons that are hinged by only the flexible epoxyglass top sheeting, "boundary layer" air-bleed holes along the entire span of the wing, and turbulators on the bottom wing surface. The wing loadings are about 25 ounces per square foot, and these airplanes can stay aloft for 3 minutes in a glide from only 200 feet. These aircraft also have to withstand the G-load of a "full-up-elevator" pylon turn at an air speed of 200kph.

Werner Detweiler, who won the Pylon Racing, works for Graupner and is the designer of the Elektro-UHU, the speed of which was very hard to believe; it seemed to be faster than glow-engine-powered Quickie 500s. Charlie Brunner is an outstanding Quickie 500 racer and an informal challenge race was set up between Charlie Brunner's Nats-winning Rossi .40-powered Quickie 500 and Werner Detweiler's electric racer. Those who saw this race concluded that electricity had "arrived" as the power source for R/C airplanes when they saw this race end in a *dead heat*!



Werner Detweiler (1st in pylon, 3rd in 7-Cell Duration) came all the way from West Germany to compete. Hans Graupner (right) seemed pleased with the performance of his Elektro-UHU design. Guy Revel (center) officiated and covered the event for the French modeling press.



Officer Simpson, St. Louis P.D., eventually caught up with some of the more rapid electrics. No citations issued!

Conclusions

The incredible performance of not only the highly specialized F3E scratch-built aircraft, but also the little 66-inch-span Elektro-UHU airplanes that competed at St. Louis, made one wonder just what the heck has been going on in the USA in the way of *airplane* design. The American image of an electric-powered (EP) airplane is that of a very light-wing-loading "floater" that appeals only to the geriatric set. But the Europeans came over with electric airplanes that are *exciting*—fast, aerobatic, able to accelerate out of sight vertically in seconds, strong, fantastic drag-free glides. The little Elektro-UHU kit has some of these characteristics, while still qualifying as a beginner's airplane. Where are the



Graupner's electronics designer, Mr. Robisku, shares some sunshine with F3E Motor-Glider winner Rudolf Friedenthaler (Austria). Second-place Urs Leodolter was only six points behind.

1988 F3E ELECTRIC WORLD CHAMPIONSHIPS

Event	Position	Contestant	Country
7-Cell Duration	1	R.B. Flockhart	England
	2	J.P. Schiltknecht	Switzerland
	3	Werner Detweiler	W. Germany
Open Duration	1	G. Shering	England
	2	J.P. Schiltknecht	Switzerland
	3	R.B. Flockhart	England
Aerobatics Turn-Around	1	Urs Leodolter	Switzerland
Aerobatics, Masters	1	Urs Leodolter	Switzerland
	2	Emil Giezendanner	Switzerland
Pylon Racing	1	Werner Detweiler	W. Germany
	2	Guy Brouquieres	France
	3	Charlie Brunner	USA

DAWN-TO-DUSK EVENT

Position	Team	Ave. Flight	Aircraft Type	Country
1	Team Matterhorn	38 minutes	A variety	England/ Switzerland
2	Team Graupner	32 minutes	Prototypes of new "Pink" Graupner EP; Silentius wing	W. Germany
3	Team Airtronics	12 minutes	Astro Challengers	USA

F3E MOTOR GLIDER (TEAM RESULTS)

Position	Points	Country
1	11,038	Austria
2	10,947	W. Germany
3	10,906	Switzerland
4	10,431	Italy
5	10,266	USA
6	10,181	Netherlands
7	10,010	Australia
8	8,763	United Kingdom

F3E MOTOR GLIDER (INDIVIDUAL RESULTS)

Position	Contestant	Points	Country
1	Rudolph Freudenthaler	3,881	Austria
2	Urs Leodolter	3,875	Switzerland
3	Norbert Hubner	3,768	Switzerland

F3E 7-CELL GLIDER

Position	Contestant	Country
1	J.P. Schiltknecht	Switzerland
2	G. Shering	England
3	Chuck Hollinger	USA

American equivalents of these airplanes?

Could it be that the wonderful glow engine has spoiled us all? With the easy power of a glow engine, we've been able to fly airplanes that are poorly designed. Anything will fly with a sufficiently strong glow engine—Flying Carpets, shovels, Ugly Sticks, plastic ARFs, witches' brooms, airplanes made out of

drainpipes—anything!

Apparently, in Europe, because of its noise, the glow engine has been restricted far more than it has been in the USA, so the Europeans turned to electric power. They've designed good motors, and so have the Americans; the Japanese pro-

(Continued on page 104)

TECH TIPS

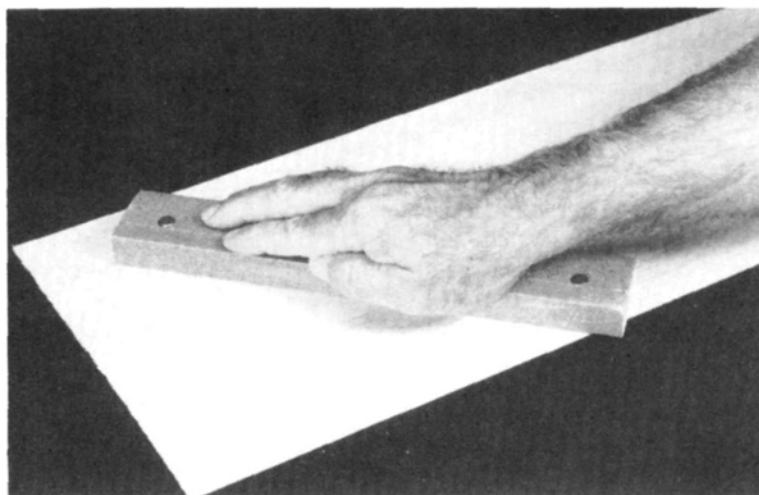
Iron-on balsa skins for cut foam cores

by RANDY RANDOLPH

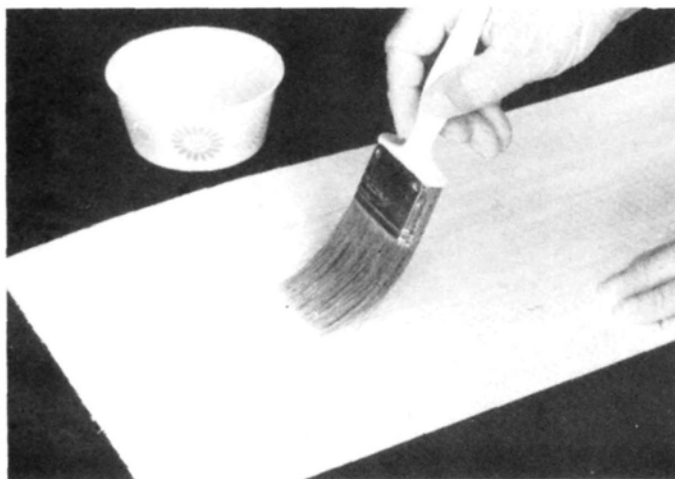
Cut foam cores provide the basis for building some of the most accurate wings around. Bonding the balsa skins with contact cement can be tricky, and using epoxy can add undesirable weight. This technique is fast, clean, inexpensive and provides a bond that's at least equal to other methods. Give it a try.



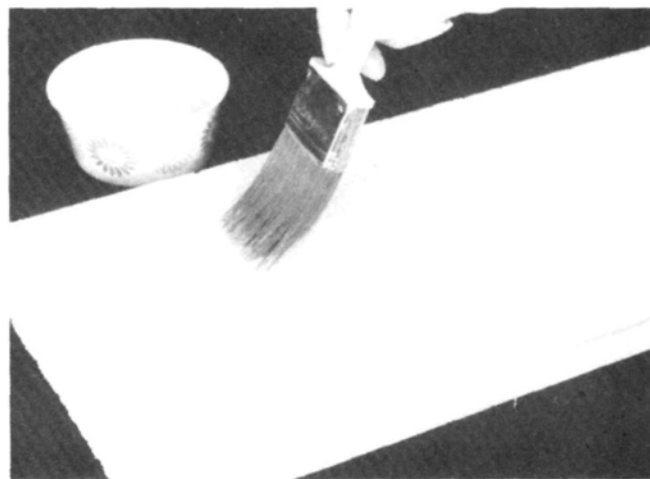
1. Prepare the core by gluing the balsa trailing edge into place; a quick-set epoxy is best. Properly cut cores produce the most accurate airfoils.



4. After the wing skins have been glued together to form the proper width, sand them with a sanding block and medium sandpaper to remove any high places. Then go over the skins with a tack rag or dry brush to remove any dust.



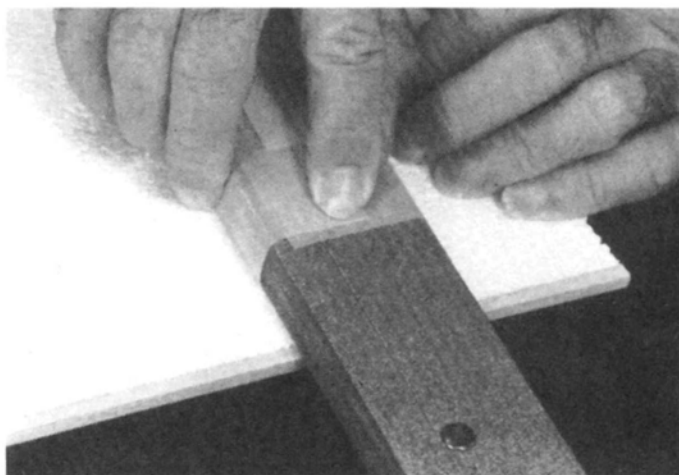
7. Paint the glue on the smoothed side of the skins. Brush with the grain and be sure to cover the side completely. At this point, you'll be glad you added the food coloring. Green was used here, but it didn't photograph well.



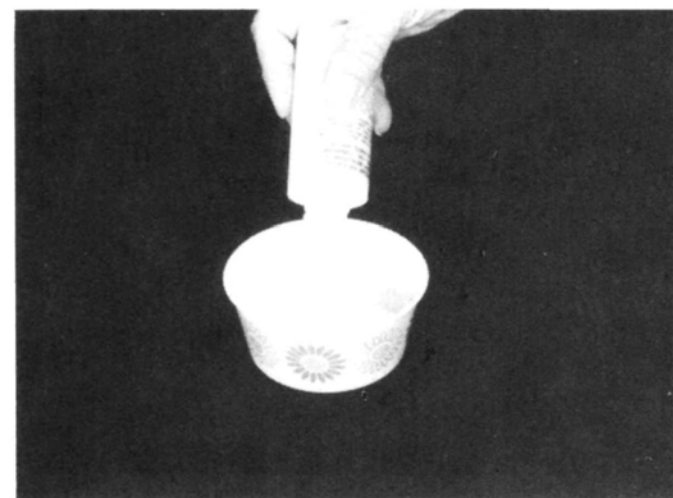
8. With the glue, paint both sides of the cores for smooth, even coverage, and allow it to dry thoroughly. The glue can be sprayed onto both the cores and the skins with a paint gun, but be sure to clean the gun with water immediately after use, or it will never work again.



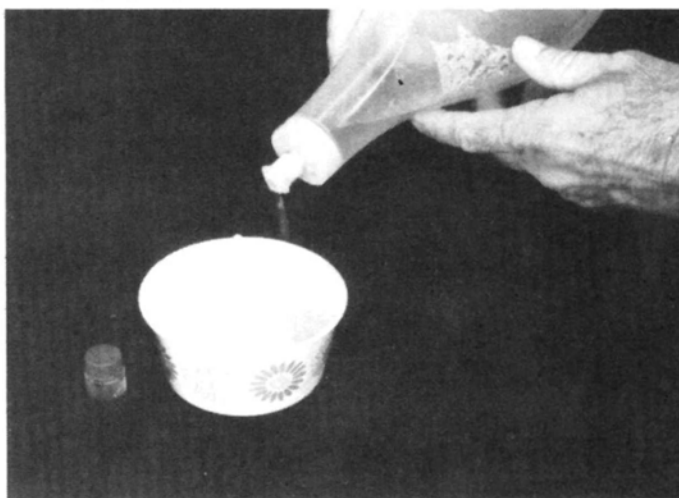
2. When the epoxy has set, remove the wings with a pair of needle-nose pliers. To break the bond caused by the glue, twist the pins before pulling them out, and they'll come out very easily.



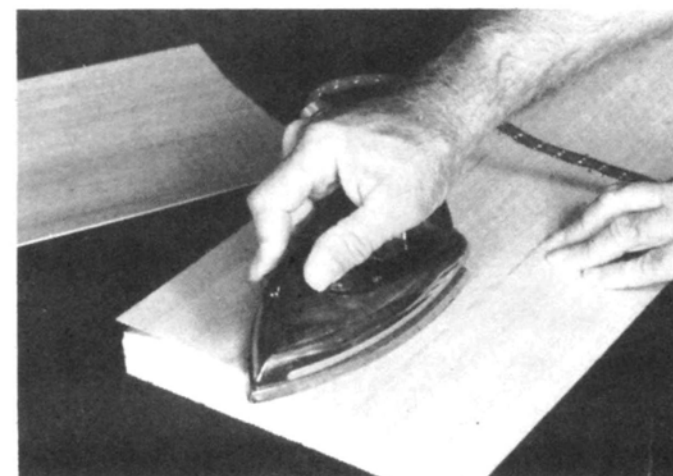
3. Wrap a piece of bond paper around the end of a sanding block to avoid sanding the foam, then shape the trailing edges to the core. Careful work will produce a perfectly shaped edge without damaging the foam.



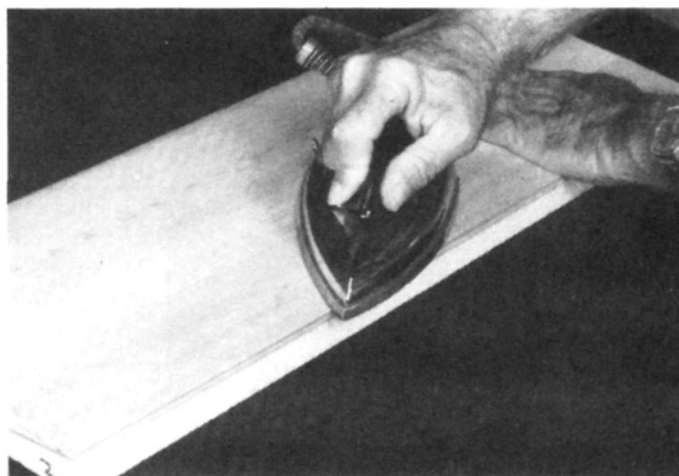
5. Pour an ounce of an aliphatic resin glue (e.g., Wilhold, Titebond or Elmer's) into a suitable container. Plastic food containers are perfect for mixing.



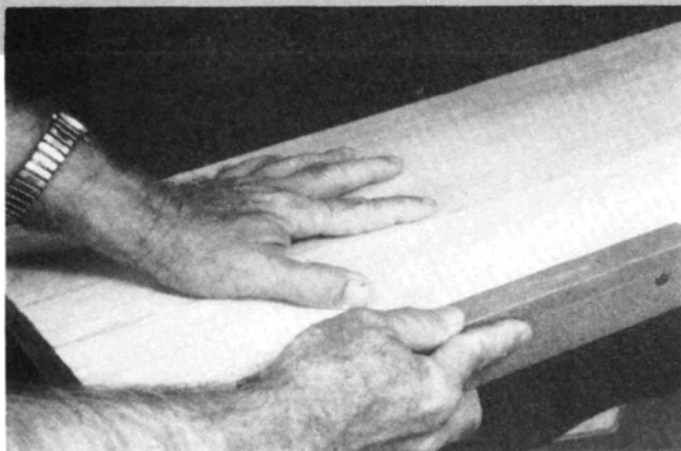
6. Mix $\frac{3}{4}$ ounce water into the glue and add some food coloring, which will allow you to see the glue coverage better when it's applied.



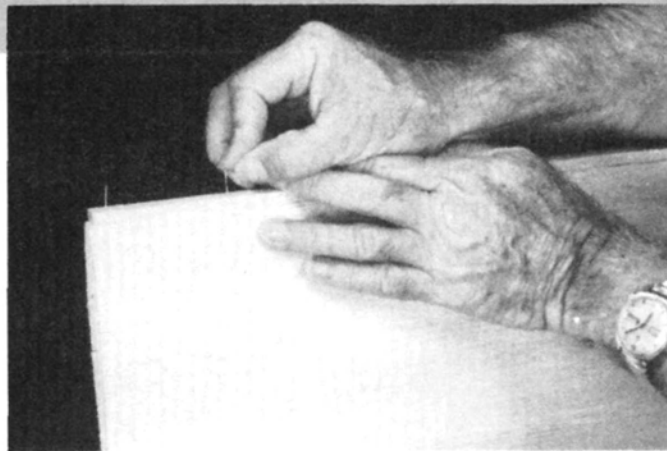
9. After the glue has dried thoroughly, place the skin and core together on their glued surfaces. Fit everything just right and apply heat with an iron, set to the temperature for ironing wool. Iron from the high point to the edge.



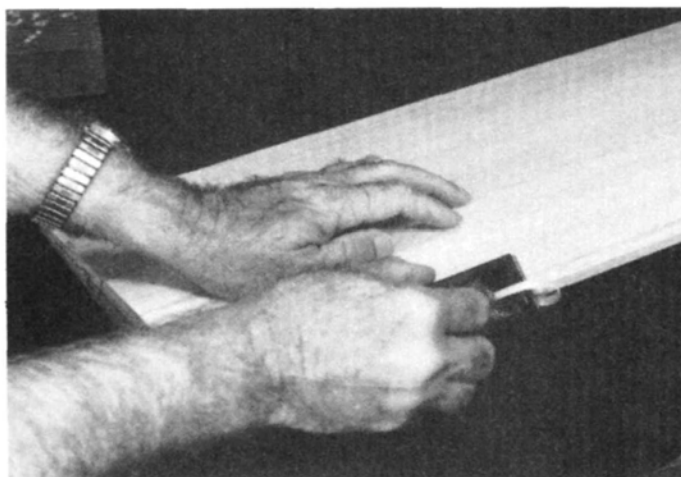
10. Slide the iron from the high point to the trailing edge, and from the high point to the leading edge. The bond is formed instantly and little pressure is needed, just as with heat-shrink coverings. Be careful not to crush the foam.



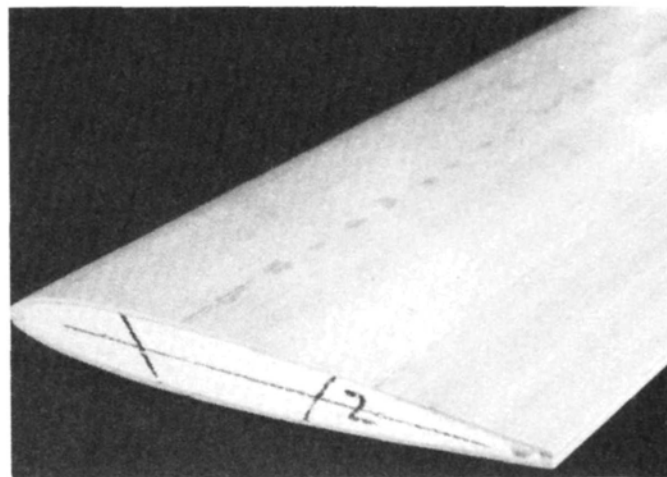
11. Once the skins have bonded to the cores, sand the excess skin from the leading and trailing edges with a sanding block. The trailing edges are complete, but a leading edge must be added. Be sure to keep the uncovered leading edge square.



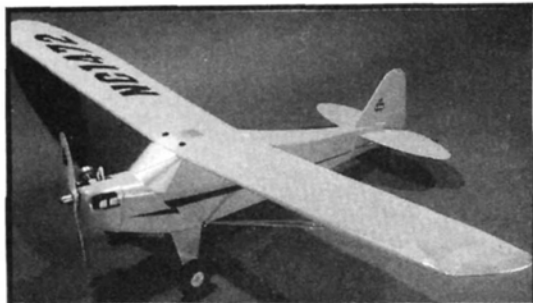
12. Using the same procedure as for the trailing edge, epoxy the balsa leading edge into place. When the epoxy has set, remove the pins with a twist as before. Be certain the balsa for the leading edge is wide enough to cover the foam and the skins.



13. Shape the leading edge to the wing with a razor plane or sanding block, then finish-sand the skinned core. If you place the core in half of its sheath while you work on it, it's much easier to handle and isn't susceptible to warping.



14. Here's the completed skinned core ready for paint or covering. The marks on the end of the wing identify it with its sheath. Don't worry about applying a heat-shrink covering, because once the glue has set, only balsa-burning heat will dislodge it.



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BASICS OF R/C

(Continued from page 14)

manufactured, do a pretty good job, so their selection isn't as crucial as that of the receiver when you're choosing a system.

In one of my pictures, you'll see a mock-up of a control system that was used to demonstrate the importance of frequency control. Several transmitter/receiver systems on the same frequency were used to show how interference affected the controllability of an R/C aircraft. Regardless of the type of modulation used—AM, FM or PM (Phase Modulation)—the results were the same. When any other signal appeared on the same frequency, there was a complete loss of control.

The device is built of sheet balsa and it has masking-tape hinges. The two servos are mounted with double-sided tape, and the pushrods are music wire with Z-bends in each end. Various receivers are connected to the servos with patch cords that match the connections on the receivers with those of the servos.

The demonstration is impressive and, when done at club meetings, usually improves the use of the frequency-control systems at flying fields. Everyone tends to take things for granted, and an occasional gentle reminder is necessary to make us aware of things we've become too casual about. It would be great if every newcomer to our sport could see such a demonstration and hear an explanation of how the frequency-control system works at his field. Flying R/C aircraft carries a responsibility to other fliers as well as to oneself.

The other picture shows a slick way of trimming ribs so that center-section sheeting can lie even with the rest of the ribs. Simply adjust the stripper to the proper width and slice around the rib. This trick has been used by old-timers to taper the last ribs into those elliptical tips that were so popular on airplanes during the Golden Age of aviation. Just think, 50 years from now, these will be the "golden years" of space exploration! I wonder if they'll have the same romance!

**Here is the address of the manufacturer mentioned in this article:*

Ace R/C Inc., 116 W. 19th St., Box 511C, Higginsville, MO 64037. ■

SMALL STEPS

(Continued from page 28)

as the QRC .049, but it weighs an ounce more.

If even this isn't quite enough to bring a tail-heavy airplane into proper balance, another ounce or so can be added to the engine by tightly wrapping a length of lead drapery weight around the front of the crankcase. (This material is a ribbon of $\frac{1}{32} \times \frac{5}{16}$ -inch soft lead, which weighs 1 ounce per foot and is used in the lower hem of window drapes to make them hang straight.)

(Continued on page 60)

Precision Tools



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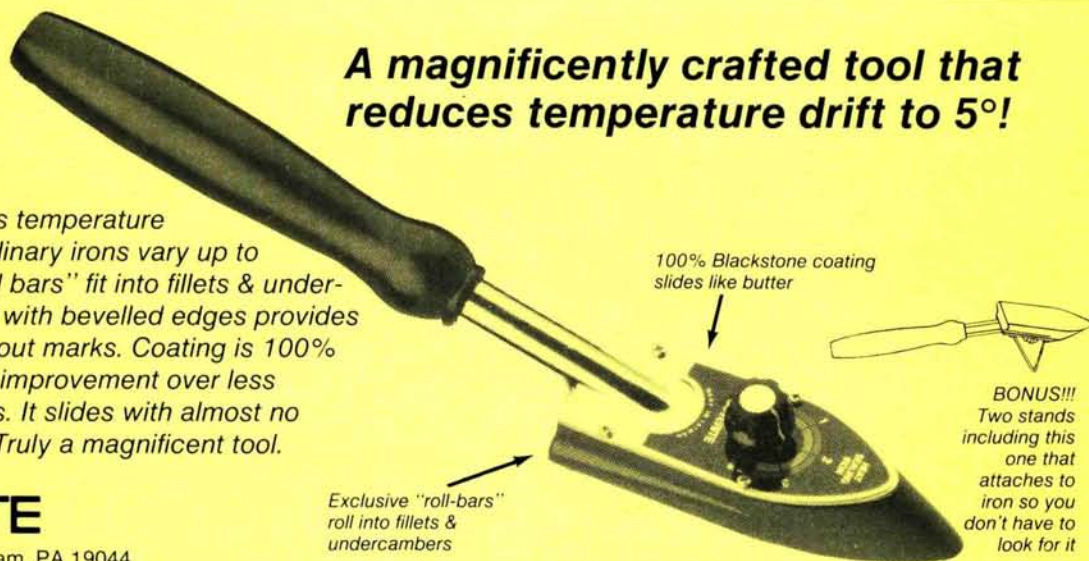
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- Wing loading 23.4 to 27.5 oz./ft.²
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- Thrust to weight ratio .73
- Power req'd. — .25 eng. & fan unit

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SMALL STEPS

(Continued from page 59)

It seems a shame to have to add cold, dead, lead weight to an R/C model that may already be a bit too heavy. But if you want your airplanes to fly well and respond accurately to your control commands, they must be properly balanced. Trying to fly a model that's tail-heavy—even just slightly—is flirting with disaster.

It's far better to have an extra couple of ounces of lead on an R/C airplane's nose

than an extra hole (decorated with bits of balsa and tatters of MonoKote) in the surface of the flying field! ■

EZ PT-19

(Continued from page 36)

really is. However, they also state that "if you are new to radio-control flying, you should not fly the Fairchild PT-19 but have an expert fly it." This is good advice

with any model.

Flying the PT-19 is a real pleasure. The Como 40 with an 11x5 prop gives good performance, though I wouldn't use less power than that. It's very aerobatic and its lightness (6 1/2 pounds) makes it very stable with excellent slow-flight ability.

This is an excellent, well-engineered kit. I felt a little intimidated at first by the unfamiliar construction techniques, but

(Continued on page 65)

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Field & Bench Review

Type: Sport/Pattern ARF

Span: 61 inches

Weight: 4.5 pounds

Wing Loading: 16.21 ounces per square foot

Length: 59 inches

Wing Area: 640 square inches

Power Required: .40 to .45 2-stroke

No. Channels Required: 4 (5 with retracts)

Sug. Retail Price: \$149

Features: Balsa and foam-wing construction; covered and painted; three landing-gear options; includes fuel tank, spinner, wheels.

Comments: Light and flies well for intended purpose. Landing-gear options show versatility. Lacks forethought in the engine-mount system. Quality is average; instructions are minimal.



A.M.S IMPORTS / CHUAN MODELS

by MIKE LEE

THE WORLD OF Almost-Ready-To-Fly (ARF) aircraft keeps growing, with ARF models now available in almost every category of our sport. This review deals with an entry in the sport-pattern category: the Champion 45 by Chuan Models, which is distributed by AMS Imports*.

The Champion 45 ARF is a low-wing high-performance sport and pattern bird in the 40- to 45-size engine category. It's a rather straightforward design, using tried-and-true design elements to ensure an airframe that performs well. The double-tapered wing is of foam core and balsa sheeting. The foam core has been extensively machined to allow the installation of retracts (with associated hardware) or fixed gear. You may also wish to configure the bird with conventional or tricycle gears, and the wing is cut to allow this,

CHAMPION 45

too. The fuselage is a balsa-and-plywood affair, with tail feathers of sheet-balsa

wooden components. All parts of the basic airframe are covered with a colored, fuelproof self-adhesive plastic covering material. Sounds like fun, so let's put one together and see what it's like.

ASSEMBLY: The assembly begins with the wing, which is simply two halves and two ailerons with a dihedral joiner in the middle. The joiner is of hefty plywood, and it takes some effort to seat it fully into the wing. Medium-set epoxy works well here. Simply "glop" some onto the joiner and insert it into the wing half; repeat for the other half and allow it to set. The joiner seats very deeply and is flush between the wing skins, creating a good, strong bond. Using the kit-supplied hinges, ailerons are added next. I detected a slight warp in the ailerons, and this produced a gap between the

This attractive, imported ARF sport pattern model assembles quickly and can be built as a trike or a tail-dragger, fixed gear or retract

trailing edge and the aileron leading edge at the midpoint of the aileron. Also, one wing-tip trailing edge was cut irregularly, so causing the aileron to look misaligned.

As already mentioned, the kit provides for either tail-dragger or tricycle-style fixed-gear positions. The foam beneath the balsa skin is cut away or reinforced to allow for either style. If you choose the tricycle style, the kit provides a nose-gear bearing with steering. If you like, retracts may also be installed; the wheel wells and liners are included in the hardware kit. The kit makes life easy, as the cut lines on the balsa skin are marked out and can be seen through the plastic wing covering. Our model used fixed gear in the conventional tail-dragger style. Fitting retracts later is easy to do by simply removing the fixed gear blocks, which are held in place with four wood screws.

Moving to the fuselage: The tail feathers are located on the fuselage and affixed. To make the fit, you must cut away the very tip of the fuselage, which covers the entrance to the horizontal stab. Alignment was precise, taking away one of the biggest worries of aircraft construction. The vertical stab was just as easy, but you *must* insert the vertical stab carefully to ensure that it's level. There's a thin balsa floor just above the horizontal stab, and this is easily punctured if you stick the corner of the vertical stab in first.

One final note on the tail feathers: You must remove



Smooth, inverted pass, Champion is comfortable either way.

the plastic covering before attempting to glue the parts into place. Use only a new, sharp, razor blade to remove the film, or you could accidentally cut deeply into the balsa itself, so damaging the strength of the part. Cut away only enough to make the contact area of the joint, and then give it the glue treatment.

Mounting the tail wheel is a nice, easy chore. The kit-supplied tail gear easily bolts into place, providing a solid, effective, steerable tail-wheel assembly.

The engine is installed next, and it's mounted using a large metal plate attached to the rear of the engine. It actually fits to the rear of the engine using the backplate screws. However, you're on your own to find those screws, as the kit doesn't provide them. Once these have been secured, you're supposed to have your choice of mounting the engine either upright, inverted, sideways, or canted at 45 degrees vertically or horizontally. There are plenty of holes in the plate to allow for such versatility, but if you attempt to use any position other than upright or inverted, you'll find that the plate-mounting bolts will hit the engine. That makes it useless for sideways or canted mounting positions. The ship seems to favor the inverted position, so that took care of that question. The plate and engine then mount to four studs in the fire wall.

Another minor flaw was the size of the holes for mounting the engine to the plate. I realize that engines differ in size, even when they're of the same displacement, but I've yet to find an engine that quite fits the mounting holes of this plate. To mount the engine, I had to elongate the holes to fit it. (Not a big problem, but one that shows little forethought by Chuan.) Last, the kit calls for self-locking nuts to be placed on the plate-mounting studs in the fire wall. One nut per stud is installed and then the engine plate, followed by another nut per stud. However,



Crisp, attractive appearance. Remember the time it used to take to produce one this pretty?

CHAMPION 45

no locking nuts were found anywhere in the kit—only *standard* nuts. These had to be replaced or they'd vibrate loose under power.

The engine used for this review was the Magnum Pro .45 FSR-ABC engine from Varicom*. This engine features ball-bearing shaft support, ABC construction, Schneurle-port scavenging, and a twin-needle carburetor. Providing the air movement was a Zinger 10x6 standard prop, and this fit under the kit-supplied spinner.

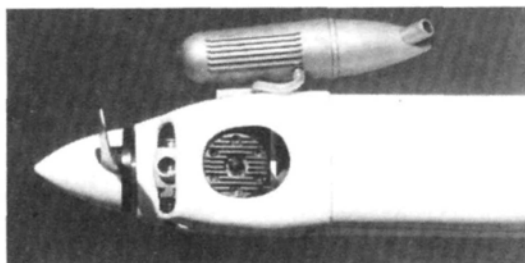
The fuel tank was easily installed, and its capacity was darn near enough to fly cross-country! There was one slight hang-up when installing the tank to the fuselage. Although the fuel-feed and vent lines fit through the fire wall, there's nothing to support the tank at the front. I solved this by placing the tank as desired and then filling the cavity in the fire wall with a silicone adhesive. If you have to remove the tank later, it can be removed with little effort.

The flexible, plastic cowling that won't crack under vibration is now fitted to the nose. It's easily cut out and fitted to the engine, but you must provide adequate venting to allow air circulation. I cut out the entire lower section of the nose so that the carb and head can receive adequate air. The cowling fit nicely and made the nose clean.

The fire wall is finished with a coat of epoxy, which seals the exposed wood. This should have been done in the factory, but it isn't *that* big a deal. The cowling is finished with sticky, colored material to match the fuselage. However, this is a tricky affair at best, requiring very careful application to get the covering down smoothly.

The canopy is next, being sealed with the trim-tape material in the kit. Don't leave this out, as I've found that this, rather than the glue, is what really keeps a canopy in place. The wing is mated, and we move to the radio installation.

My only comment about radio installation is that it was easy. The servo-mounting tray was apparently glued to the floor of the fuselage, and I thought this had happened accidentally; this wasn't the case. You simply



Magnum Pro .45, even though inverted, worked well. Adequate cooling helped. Muffler not particularly quiet, but no worse than most.

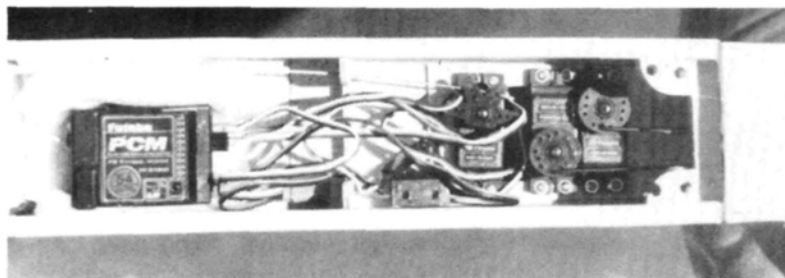
cut out the balsa inside of the tray, and the cavity below allows you to fit any standard radio gear. Neat idea! I used the Futaba* PCM 8-channel radio, which serves me very well on the contest circuit. Installation and fit was no sweat, with lots of room.

The rest of the aircraft is finished by the addition of trim tape where needed and, finally, the wheels. All-up weight of the bird is a mere 4.5 pounds loaded. With a tad more than 600 squares to the wing, we should see some great performance. By the way, the kit gave no guidance about the balance point of the aircraft. I assumed the point to be 40 percent back from the leading edge, which, as you'll see, worked well for us. Off to the field we go!

PERFORMANCE: At the field, the Magnum Pro came to life easily enough, but it was rather balky in the idle. Some major fiddling had to be done to make it dependable at idle. Top-end power was quite good, and I felt confident of the engine's ability to pull the Champion. Once settled in, I set the Champion down and pointed it into the wind.

At full throttle, the Champion comes off fairly quickly, tracking predictably on the roll and into the

(Continued on page 104)



Radio compartment is spacious; Futaba PCM fit with room to spare.

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EZ PT-19

(Continued from page 60)

once into the project, I realized that good use is being made of modern materials. I found very little to criticize in the PT-19 and my complaints were minor. The manufacturer and the importer (Sports Aviation Co., Ltd. and Hobby Shack) should be commended for their fine EZ Series of ARF models. Some may not like ARFs, but they're changing the look of our hobby.

*Here are the addresses of the companies mentioned in this article:

Lanier RC, P.O. Box 458, Oakwood Rd., Oakwood, GA 30566.

Hobby Shack, 18480 Bandilier Circle, Fountain Valley, CA 92728.

Zap; distributed by Pacer Technology & Research, 1600 Dell Ave., Campbell, CA 95008.

Tatone Products Corp., 21658 Cloud Way, Hayward, CA 94545. ■

LEN MOUNT

(Continued from page 45)

before running out of fuel, so we went home, rather miserable, but we still had a

helicopter.

Then we lost sponsors, because we couldn't guarantee any more TV coverage. But Jeff had a friend with a Hughes 500 who said he'd do it free of charge, providing that we put the name of his company on the model helicopter. We did that, and six weeks later, we went back to France, but we weren't allowed to fly back to the glider club. This meant that we had to go from one full-size airport to another—36 miles!

On the way to France, the pilot got lost for 45 minutes and he didn't have a map! If I'd been flying the model at this point, it

(Continued on page 94)

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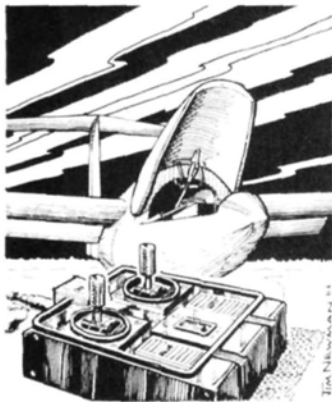
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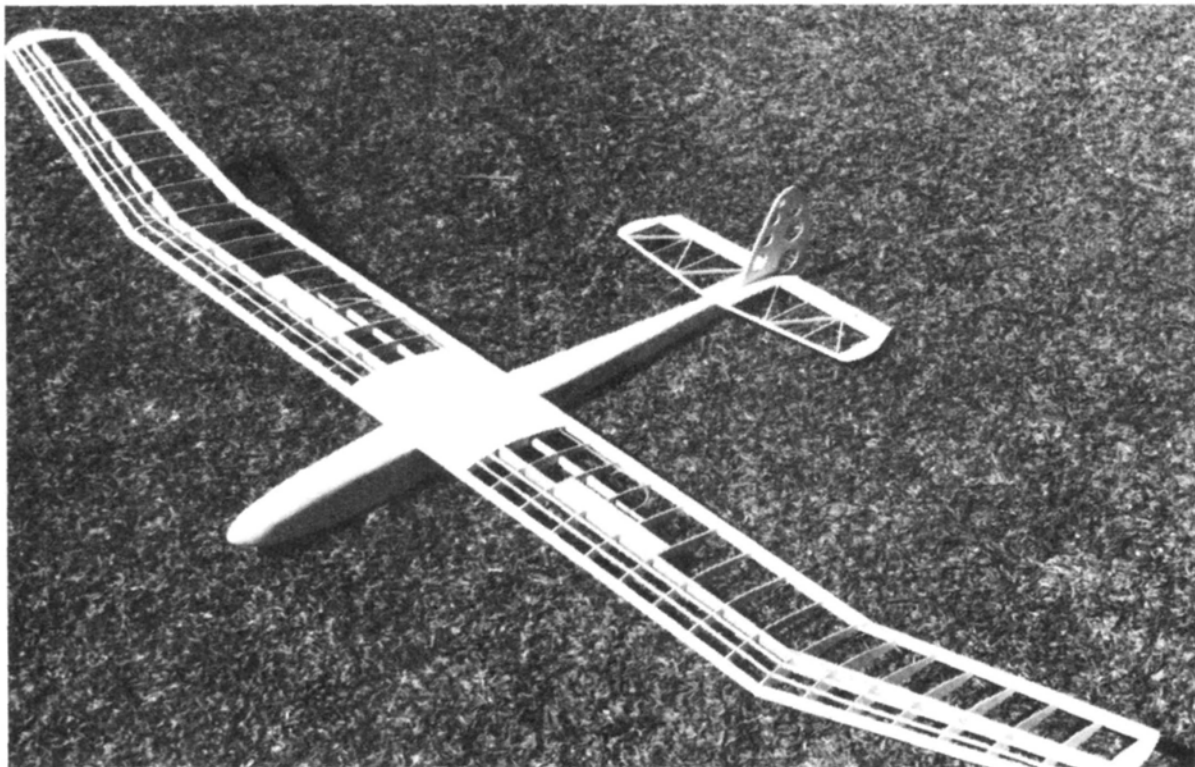
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Quiet Flight

by JOHN LUPPERGER



Completely framed-up Wanderer. No matter how good the finished model looks, I think that a sailplane is its most beautiful at this stage. There's something about the sticks and bare balsa that borders on art and gives the builder a real sense of accomplishment.

WE TEND TO TAKE our health for granted until something happens; then, in many cases, it's too late. I just returned from the hospital where I had a double surgery—nothing major, but, for the next six weeks, I shouldn't lift anything that takes effort. So I won't be able to lift my winch or battery for a while, and I'll have to depend on the help of others. Luckily, modelers (especially sailplane pilots) are a very helpful and friendly group.

Also, because of the nature of the models we fly, we tend to take safety at the flying field for granted. I always hear comments like: "It's the power guys who have all the accidents!" I don't know if that's true or not, but our models have just as great a potential for bodily harm. In the next couple of issues, I'll discuss some

specific areas of safety: winches, batteries, electric models and safe flying practices.



From the El Dorado Silent Fliers newsletter. "If it's too foggy, hazy, or cloud cover is too low... don't fly. Wait for it to clear; safe flying is no accident."

tices. If you have any safety ideas or stories that relate to safe flying, send them in, and I'll share them with everyone.

Project Wanderer

This month, I'll finish the construction phase with the spoilers and the wing-tip panels.

Starting with the last bay of the root sub-spar, cut a piece of $\frac{3}{4}$ -inch trailing-edge stock three bays long for the spoiler. Then cut a small piece of the trailing-edge stock as a cutting guide for the spoiler blade. Take this piece and lay it against the side of the two center ribs where the spoiler will be installed. Mark the trailing-edge shape and cut it out with an X-Acto knife. Then, using a piece of $\frac{1}{16} \times \frac{1}{4}$ -inch balsa, mark a strip directly behind the spoiler for a cross-rib cap strip. Cut this $\frac{1}{16}$ -inch section out of the same two center ribs. Lay the spoiler in the cutout and glue a piece of $\frac{1}{16}$ -inch scrap

balsa against each end rib to support the spoiler at each end. Glue a piece of $\frac{1}{16} \times \frac{1}{4}$ -inch balsa across the back of the spoiler bay. It fits in the previously cut ribs and is glued flush with the top of the two outside ribs. I usually make sure that the spoiler fits in such a way that it sticks up slightly above the wing's upper surface. With a T-bar, I then contour the spoiler to the curve of the wing.

The spoiler-cable tube is installed next. This runs from the center bay of the spoiler to the center section of the wing just behind the main spar. A piece of scrap sheet balsa is glued in vertically between the two center spoiler ribs to hold the end of the tube. A hole is drilled through this piece and at the rear of each rib between this point and the center section. An angled hole is then drilled just behind the main spar, slightly to one side



Project Wanderer's tail surfaces. Stock shape is retained, but new wood sizes in stab reduce weight. If sheet tail surfaces are used for the vertical, lightening holes are a must to keep down weight.

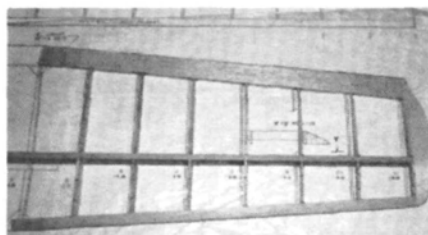
of the center ribs. The tube is then inserted through the ribs and the center sheeting and glued into place. After cutting the tubing off flush with the bottom of the center sheeting, repeat the procedure for the other side. The top center sheeting can now be installed.

The tip panels are built in much the same way as the root section; the biggest difference is in constructing the spar to accommodate the increased thinning of the airfoil created by the addition of the equivalent of one bay. Using the same $\frac{1}{16}$ -inch vertical-grain shear webs, glue

them to the bottom spar for the full length of the tip. At the position for the W4-4 rib, mark the shear web at the top edge. At the tip, the shear web is marked at a height of $\frac{7}{16}$ inch to match the W4-11 tip rib. Using these two reference points, draw a connecting line between the two marks. This line across the shear webs indicates the taper in the wing section. Using a T-bar, the shear webs are then sanded to this line. As you proceed, check the taper against the ribs by placing the spruce spar on top and checking against their upper surfaces. When satisfied with the taper, glue the top spar into place.

Glue the ribs, leading edge and trailing edge into place according to the instructions, except for rib W4-4. Glue the triangle-stock tips into place and sand to the contour of rib W4-11.

Take the center section and set it on your building board so that the spar and leading edge hang over the front edge of the bench. Weight down the trailing edge so that the wing is stable on the workbench and can't move. Line up the tip with the root section and jack it up $5\frac{1}{4}$ inches (at the trailing edge) above the building board. The spar will cross over behind the root-section spar and can be marked for cutting. Where they cross over, the excess will be cut away from the bottom of the tip panel; also, mark where

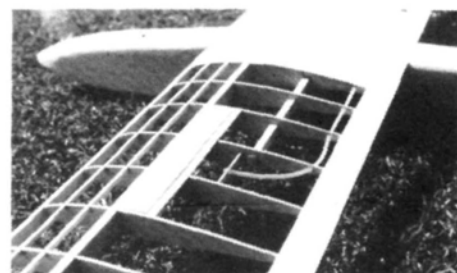


Final phase of construction for Project Wanderer is the wing-tip panel. Tip panel builds in the same manner as root section. Taper in tip requires that shear webs are hand-sanded before installing top spar.

it crosses over the root spar for glue placement. Coat with epoxy, and clamp the two spars together. This criss-cross dihedral joint works in the same way as the stock arrangement. However, since

we've used a full-depth spar, we have a larger gluing surface than with the stock kit, and, consequently, a stronger joint. Finally, glue the W4-4 rib in at an angle to match the tip panel.

That's it for now; next month, we'll install the radio and finish Project Wanderer.



Spoiler detail of Project Wanderer. Plastic tube for dial chord goes through rear of ribs to center section. Scrap balsa secures it near spoiler, which is made of $\frac{3}{4}$ -inch trailing-edge stock.

Peck-Polymers* Silver-Streak Motor

In the September '88 issue, I featured a motor review by Bernard Cawley Jr. of the Puget Sound Electric Model Flyers, of Seattle, WA. Well, Bernard had done it again with another great motor review, which I found in his club's newsletter, "Charge Ahead." I'll let Bernard take over:

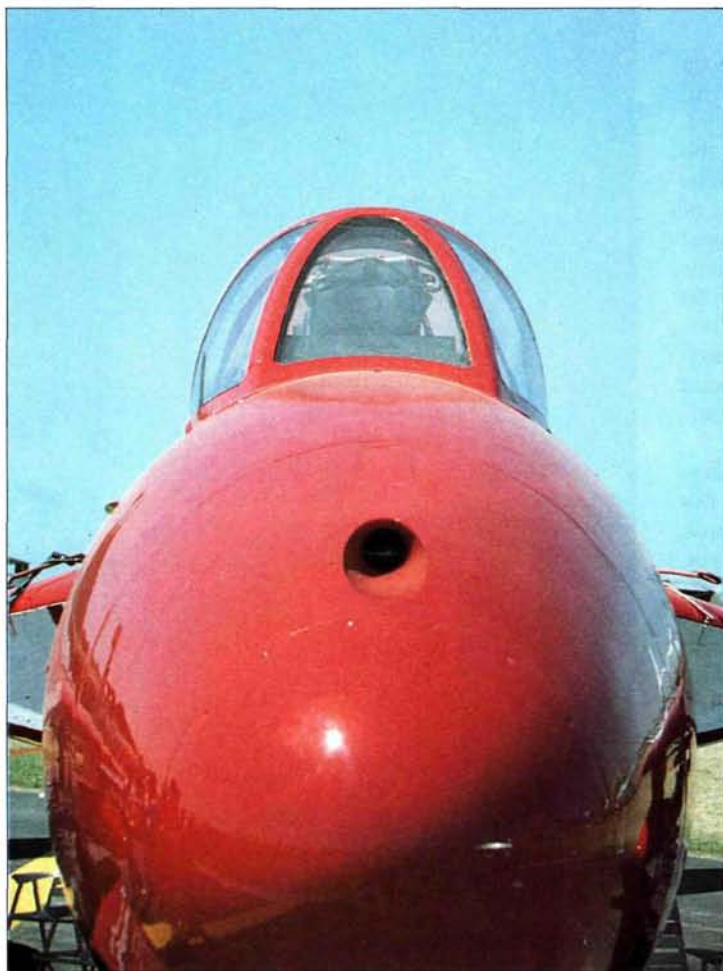
"Both in size and in performance, the Peck-Polymers Silver-Streak 035 fits neatly into the hole left in the motor market when Astro Flight dropped the ferrite 020 and 035, but it has the major advantage of being currently available. It's also relatively inexpensive, at \$19.95 for the motor.

"It's unusual in that it's a relatively high-voltage, low-current motor, using six cells of small capacity to achieve the same input power as the old ferrite 020 did on four cells by operating at 7 amps instead of 10.

● "Physical Description: The Silver-Streak, which is made by Mabuchi, is a "traditional" ferrite design, with an enclosed rear end bell and leaf-spring-style non-replaceable brushes, much like

(Continued on page 106)

Oshkosh



Not exactly camouflaged, this Hawker Hunter Mk.51 is one of a growing number of privately owned jets.

*It doesn't get
any better
than this...
Does it?*

by RICH URAVITCH

HAVE GONE TO Mecca and I have seen the light! I've also seen the ultralight, along with the classics, the warbirds, the home-builts and the heavies. As a matter of fact, there were more winged things at this year's aero extravaganza than at any of the previous editions. This was my sixth consecutive annual trek to the heartland to spend a week surrounded by airplanes and airplane enthusiasts immersed in aeronautica.

This year's Oshkosh was different in a number of respects, not the least of which was the intense heat experienced across the country. It was certainly the hottest I can remember, but it didn't seem to discourage any of the participants or spectators, who this year numbered over 825,000. I was much more aware of modelers in attendance this year; who else shoots an entire roll of film on *one* airplane, getting close-ups of the landing gear and rivet detail on a T-6? This is a scale modeler's paradise, with nearly every type of airplane available to inspect, photograph and take notes on. In many cases, the owner/builder/restorer was on hand, answering question after question about his pride and joy.

You can't help but look at these airplanes through the eyes of a modeler, as many of them, especially the home-builts, appear to be exactly that! Let me give you a good example: Back in our Jan.'87 issue, we ran a construction article on an N-3 Pup home-built that has proven to be a very popular plan. Well, lo and behold,

Photos by Rich Uravitch.



Above: The T-6/SNJ gaggle keeps getting larger; 64 at Oshkosh this year.

Left: Returning this year to the "colonies," the British Airways Concorde, guided by Capt. John Cook, impressed everyone.

an adorable, full-scale N-3, built by Bill Young and Al Reay, showed up and proceeded to win the Grand Champion Light Plane Award. They call it a "Citabriette," because its paint scheme is patterned after a Citabria, and when

you really get down to inspect it, it isn't that far removed from our models. Just walking down the flight line is inspirational; you can't help but want to build a model of everything there.

The daily air show is always fascinating to watch. You'll probably never get an opportunity to see so many different types of airplanes doing so many different things, all right out in front of you. The Warbird portion of the show has the "heavy metal" birds, recreating what has been done so many times in combat: formation flying, strafing and bombing runs



Above: Finished in O.D. warpaint with invasion markings, or as a highly polished civilian model like the one featured in this issue, the DC-3/C-47 is everyone's favorite.

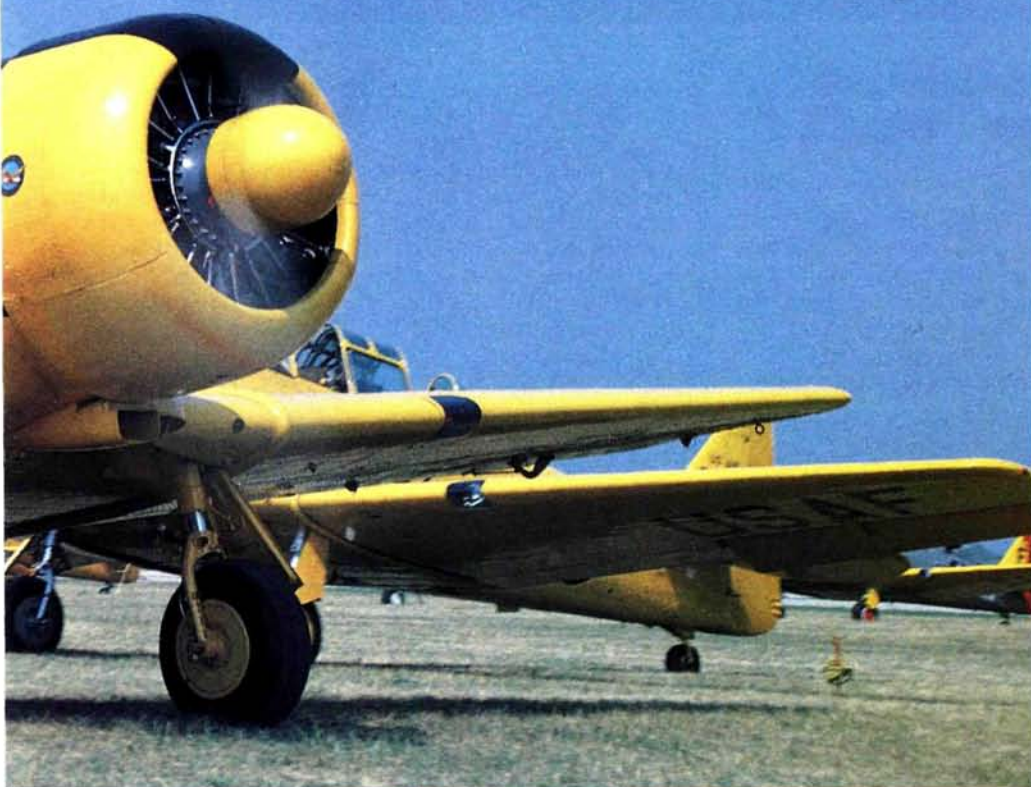




The ever-fertile
aero minds of Burt
Rutan and John
Roncz yielded this
AT³ Demonstrator.



Perhaps the earliest representation of
powered flight was this Curtiss Pusher
replica. Constantly airborne.



the returnees were the always-amazing Concorde and the AV-8A VTOL Harrier, which noisily did things that you'd never expect a fighter aircraft to do. The more well-heeled among the spectators bought a ride in the Concorde, and this immediately made them members of the Mach One club on a brief jaunt north over Canada. My name wasn't on the passenger list, but I *did* manage to get airborne, albeit in a less rapid manner. I jumped aboard Budd Davisson's camera plane—a door-less, nah, make that nearly left-side-less, Piper Seneca for a bit of air-to-air work. We rendez-voused over Fond du Lac with a pair of beautiful kit-built Swearingen SX-300s that Budd talked through a series of formation 360

orbits for the benefit of my camera. If you think Davisson doesn't work hard at getting some of the shots we use in *MAN*, talk to me—I'm a believer! Another recently completed SX-300 that I'd love to have stacked up with the other two is the one owned by Byron Godbersson of Byron Originals. Could this mean we can expect a kit of a kit-plane? They already make an R/C Glasair, you know.

Innovation abounds at Oshkosh. Everywhere you looked, both in the home-built area and exhibitor's



Oshkosh just
wouldn't be Oshkosh
without the 51s. This
was one of many
glistening examples.



Replica Japanese "Kate" torpedo bomber participated in the Warbird air show.

that are usually preceded by the "Grasshopper" liaison types "scouting" the battlefield. If aerobatic demonstrations are your preference, you'll be treated to some of the best in the country, on a daily basis. Same goes for current-day "barnstorming" routines with hairy-chested Stearmans and Wacos providing the strolling ground for wingwalkers.

Even airplanes that I've seen here before continue to be impressive. Among



The mighty swing-wing Rockwell B-1B at touchdown. The sign says it all! They're probably serious!

B-1B comes to Oshkosh... entered in the "Warbird" category?

ONE OF THE highlights of the 36th Annual EAA Convention at Oshkosh was the arrival of a Rockwell B-1B bomber that remained on static display for most of convention week. The ramp area was roped off around the airplane and the perimeter secured by armed Air Force personnel. Although it didn't fly any demonstrations, it afforded many visitors a rare opportunity to view this swing-

wing, supersonic giant, which will replace the rather ancient B-52BUFFs and be augmented by the recently unveiled B-2 "Stealth" subsonic bomber. In spite of being around for a while (cancelled by the Carter administration, re-instated by the Reagan administration), the B-1 program has generally been treated in a low-visibility, controlled-exposure manner, never really getting much press. Although the production line has been shut down after producing nearly 100 examples, it's very likely that this sleek machine will form the backbone of our piloted deterrent force for well into the next century. After that, who knows, one might even show up in the "Warbird" area at Oshkosh '25!



The Combat Jets Flying Museum's CF-104D Starfighter has to be the ultimate in rapid, personal, people movers.



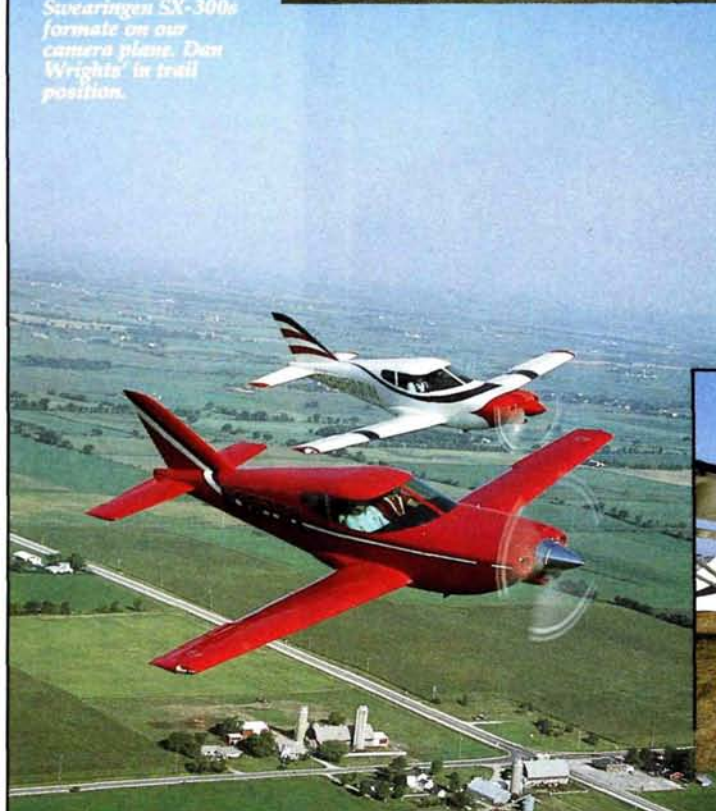
Not a Bob Violett Models R/C F-86F, but the 12-inch-to-the-foot version owned by Combat Jets Flying Museum.

displays, the use of composite materials was obvious. Molded fuselages, molded wings with integral tanks, fiberglass, foam, Kevlar, Nomex. These materials sound familiar? They should; they're becoming more and more prevalent in the models we build. Where you find innovation, you'll obviously find innovators, and probably no one qualifies more than Burt Rutan. He heads up an R&D outfit called Scaled Composites, which specializes in producing one-off, generally reduced-scale, prototype aircraft as proof-of-concept articles. The most publicized of these is probably the radical Starship,

Somewhere between Ziroli's and full scale in size, this W.A.R. Zero looked great.



A beautiful pair of Swearingen SX-300s formate on our camera plane. Dan Wright's in trail position.



V-6 Ford-powered sport racer designed by Davey Blanton. Looks like it would make a great model!



This Air Force captain entered his F-16 electric jet in the Warbird category. Probably disqualified because he didn't build it himself!!

produced under contract to Beech. Well, Mr. Rutan, obviously not one to sit idle, brought his AT3 (or AT cubed) twin turbo-propelled, stacked-wing transport and put on some amazing short-field demonstrations.

As in years past, I spent much of my time in the Warbirds area, looking for subjects that I hadn't seen before. It didn't take long. It was bound to happen; it was just a question of when. The jets have arrived, and in force. Parked neatly in one section of the flight line was an F-86F Sabre, a MiG-15, a Hawker Hunter, a TF-104, a Temco

TT-1 Pinto, and an F-4D Phantom. The only one owned by Uncle Sam was the F-4. I understand that astronaut "Hoot" Gibson drives the MiG around for fun when he's not steering the shuttle. I made the Phantom Phlyers an offer on the F-4 just to be part of the "in-crowd," but they graciously declined. It wouldn't surprise me if one didn't show up at the 46th Oshkosh, 10 years down the road!

The EAA puts on a great show at this event. Much of it is a result of a well-organized volunteer effort,

with the work force coming from nearly all corners of the free world. The fact that all this airborne activity occurs safely in a very short time frame speaks well for the participants, performers and organizers alike. If you want to be dazzled and overwhelmed by airplanes, or are looking for motivation for that next model project, plan to attend Oshkosh '89. The dates are July 28 through August 3, 1989. See you there!



All the way from New York, Jim Eddy with one of a bunch of pretty Kitfoxes.

Oshkosh and Counting...

Anyone who's of the opinion that Oshkosh isn't a major event need only review the following "trivia" items that put things in perspective rather quickly....

- 9,840,825 cubes of ice were used, totaling 328,027.5 tons (132.25 tons used in 1987).
- 44,299 hamburgers were grilled, 33,548 hot dogs consumed, 33,447

orders of french fries devoured.

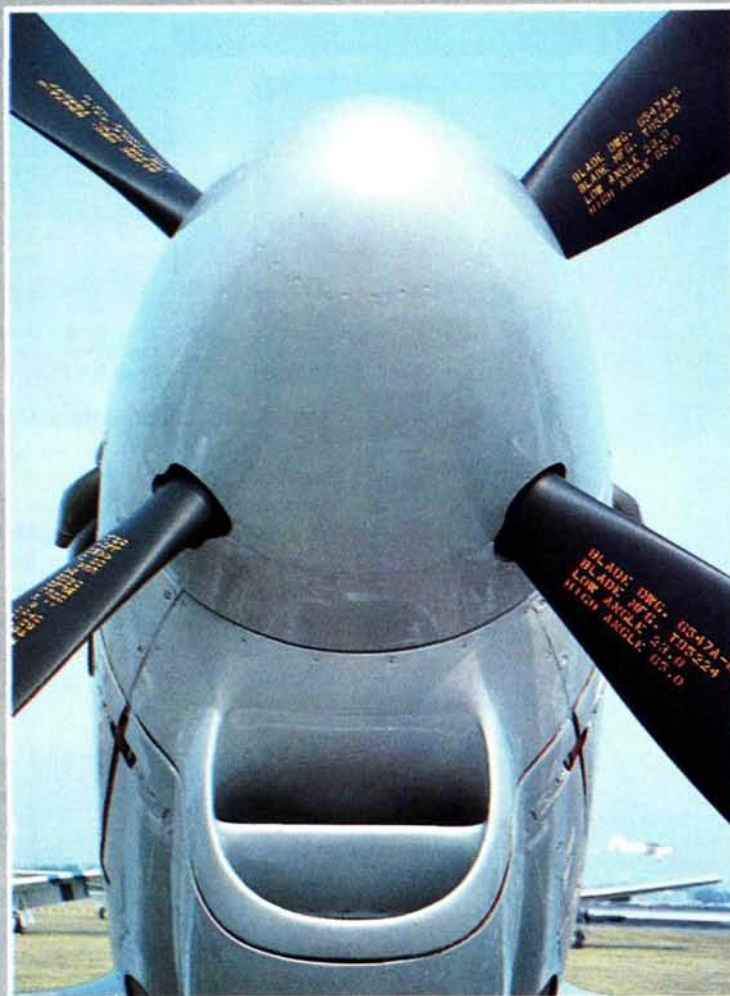
- 480,458 Cokes were sold (compared with 390,050 in 1987).
- 726 portable toilets!
- 13,032,900 sheets of toilet paper disappeared (an increase of 8 percent over last year).
- There were 470 commercial exhibitors and more than 800,000 square feet of exhibit space.
- 15,000 aircraft visited the Conven-

tion, including 12-13,000 transient airplanes and a record 2,053 show planes.

- 61,757 air operations at Wittman Field were recorded by the FAA Tower.
- 74 countries were represented at EAA's International Visitors' Tent.
- There were 972 media representatives from 22 countries registered at EAA Press HQ (breaks the record of 932 set in 1986).

WARBIRDS, both restored originals and, more recently, the increasing numbers of scaled-down, man-carrying versions like the W.A.R. replicas, always capture the imagination of everyone who sees them. Maybe it's the Walter Mitty in us that leads us to conjure up the image of responding to the early morning klaxon somewhere in England or the Pacific over four decades ago. Armed, bombed-up and strapped in, awaiting the flight lead's recognition of the green light signaling the launch, the jitters turn to euphoria and we're where we belong—airborne to face the omnipresent threat, whatever it might be. Or maybe it's just a natural inclination to triumph over the machine, control your destiny, become a giant in the shadow of awesome power—to WIN and conquer the challenge. It must be something like that, because if it isn't, someone needs to explain why warbirds and their pilots are the recipients of such exaltation from so many airplane enthusiasts. They aren't supermachines or supermen, so why all the attention? Easy! We all still have a sense of history and an imagination. These airplanes are legends about which page after page has been written and with which we can all identify. As modelers, we all digest these pages, and we use the material to create our own...you guessed it...warbird!

Modeling a warbird—any warbird—presents its own series of challenges: selecting the original subject, collecting all the documentation from seemingly endless sources, right up through the painting and detailing adventures, and that doesn't even take into account the actual building! Model warbirds have a lot in common with their full-scale brothers. Compared with other models, they're usually more complicated to build and fly, and their increased complexity makes them more maintenance intense (things like landing-gear door rigging immediately come to mind!), but all this is quickly overshadowed by the attention and admiration that the warbird (model or full-scale) inevitably receives. If scale modeling is the most demanding form of modeling, than surely the R/C warbird is the ultimate. ■



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Above: Fire-breathing Grumman F6F Hellcat taxis by.

Below: Kermit Weeks' rare bird Warbird—a deHavilland Mosquito B. Mk.35. The most beautiful use yet discovered for plywood. One of the few still remaining.



More Oshkosh photos on page 76



Above: Two-place Spitfire and British-marked P.51 D on a formation fly-by.



Left: Solo, super smoke performance by one of the T-6s.



Below: Mustang magic. Two pristine examples on formation takeoff.



Above: Generations of Marine aviation; Howard Pardue's F4U Corsair and one of the Corps AV-8A Harriers.



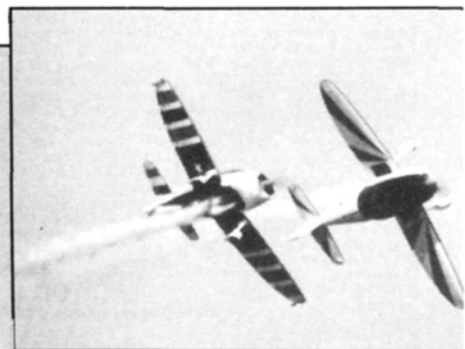
Above: N-3 Pup Citabrette won Light Plane Grand Champion award.



Beautiful "bubble-top" P-47 thundered down the runway. High-gloss finish sure makes it easy for modelers who don't like to "weather" finishes.



Replica "Val" being "shot down."



"The French Connection" CAPs in the canopy-to-canopy 360.



Kal Air Zoo's ultra-rare Grumman F7F Tiger-cat. No lack of power here!!



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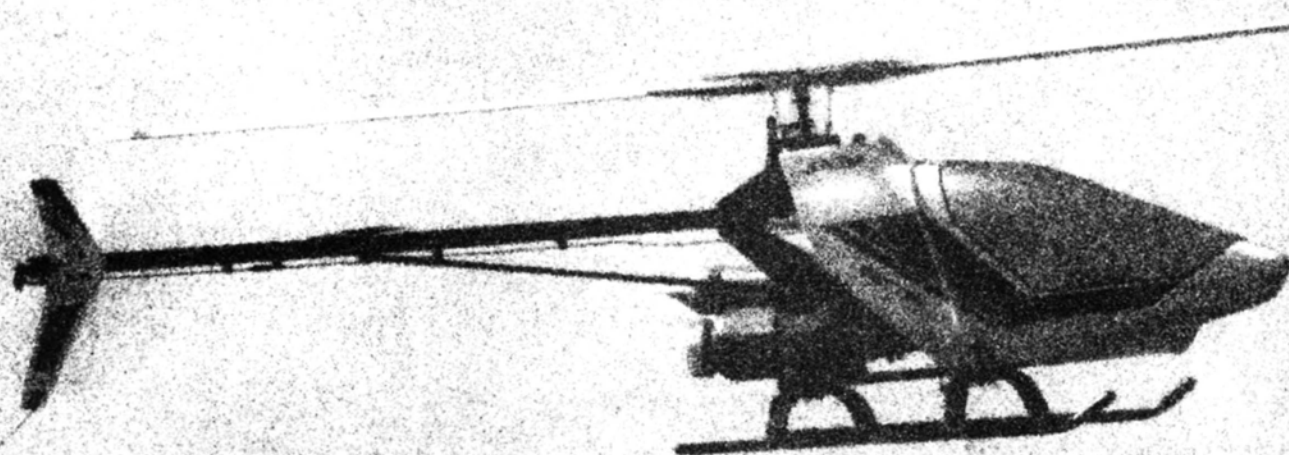
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THE OPERATIONAL FOLLOW-UP TO OUR AUGUST '88 "MINI-VAL"

Right: Author ready for initial test-flights on a clear Texas afternoon.
Below: Scout 60 in flight with four-blade head maintained good rotor speed and flight characteristics.



by PAUL TRADELIUS

IN THE SPECIAL heli Issue of *MAN* (August '88), I wrote an introductory article on the Schluter* four-blade rotor head, and this is a follow-up. So if you haven't read the August heli issue, make sure you get a copy, because there's a lot of interesting helicopter info in those pages.

Four-Blade Tracking

I ended the August article by saying that I was ready to test-fly the four-blade system, which, for convenience, I'll call the Scout 60-4 (designating the Scout 60 with the four-blade rotor head). With a set of fully charged batteries and a tank of fuel, I was ready to go. The instructions that came with the rotor head were very complete and described a method of tracking the blades, but it didn't work very well for me. Mr. Schluter suggests that you place a piece of colored tape on each blade, but at different distances from each tip. With the tape in place, any out-of-track condition can be

SCHLUTER 4 BLADE ROTOR HEAD

identified by noting the piece of tape belonging to a specific blade. I'm not sure if it was the lighting, my eyes, or that I had the tape pieces too close to one another, but I couldn't identify a specific blade, since they were all out-of-track at the beginning. However, this technique will probably

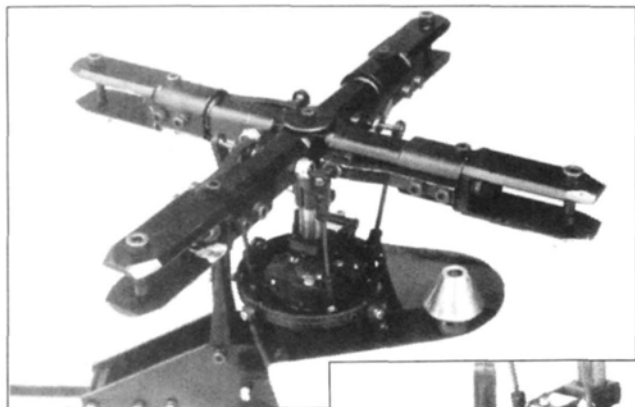
work very well if only one blade is out of track, different-color pieces of marking tape are used and they are spread further from the tip to make them more distinguishable. My problem and blade-marking setup forced me to solve the problem a little differently.

Since I *balanced* the blades in pairs (as mentioned in the previous article), I thought I could *track* them in pairs. I therefore took off one set of blades, and this left me with a basic two-blade flybarless head. I wasn't sure how the helicopter would react, but Mr. Vince Canzanese of Robbe Model Sport gave me the impression the helicopter would fly in that configuration.

(Continued on page 80)

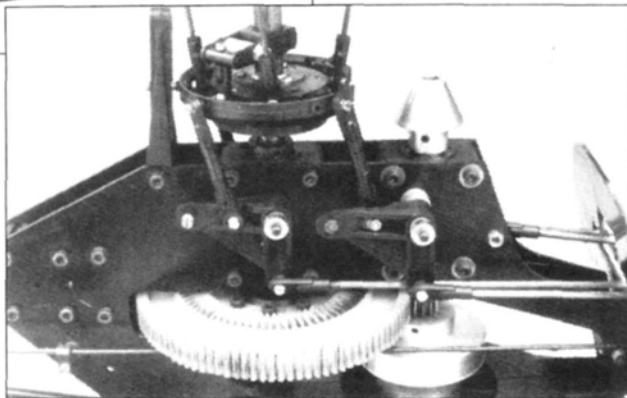
ROTOR HEAD

(Continued from page 78)



Left: Four-blade rotor head is simple, neat and easy to attach to swashplate.

Right: Reduced bellcrank throw to swashplate eliminated blade flutter with no reduction in helicopter performance.



Now, being more curious about the helicopter control than the tracking, I increased rotor speed until the Scout 60-4 was just airborne, and, sure enough, I had complete and predictable control. Being rather proud of that accomplishment, I then tested my tracking procedure. The blades were out of track, but now I was using a small piece of red tape on one blade, leaving the other tip white, and it was easy to see which blade was high and which was low. Because I wanted to keep all the blades in the same general collective-pitch range, I increased the control rod on the low blade and decreased the control rod on the high blade to bring them into track. Again, the helicopter was brought into a slight hover and re-checked for control and vibration. The control continued to be very positive, and the Schluter balancer really did its job, since I couldn't detect any vibration.

Those blades were removed and the other two installed on their respective blade holders. But now I used a piece of black tape on one tip, leaving the other blade tip white. Again, the blades were tracked as described, and again, there was no noticeable vibration in the helicopter. But the real test was to mount all the blades to see if they were in track—no such luck! However, now, instead of having all four blades out of track, I only had two pairs of blades out of track, and I

only had to see if red or black was high, and by how much, and this was quite easy to distinguish. After a couple of minor adjustments with the control linkage (always making the same adjustment to each pair to keep them in track with each other), all blades were perfectly in track.

Again, on bringing the helicopter into a slight hover, I was pleased to see that there was no visible vibration. So it seems that blades can be balanced in pairs, and this certainly makes blade construction and replacement a lot easier.

Since I was quite pleased with my success on the first day, and it was getting late, I thought I'd wait till the next day to try flying it. However, since I was on a roll, maybe I should have continued that day; the next day brought new problems that I hadn't expected.

Initial Flight Tests

At the field the next evening I again had out-of-track blades. Because the four blades can't be folded for transportation, I had to remove them, but I failed to mark each blade's position on the rotor head. The entire tracking procedure had to be repeated, but, this time, I made a small mark on each blade and on its respective blade holder, so I'll always know which blade goes where. I actually only needed to mark the blade holder of the red and black blades, since they're mounted in

matched pairs, and this always works.

Now that I was back to where I'd been the evening before, I was really ready for the initial flight tests. I was very confident of the complete control and feel of the four-blade head, but I brought the Scout 60-4 into a hover to move it about slightly before getting it too far from the ground. Again, it's a good thing I didn't get too high, because, within seconds, the blades were violently out of track and the helicopter was virtually out of control. I did manage to quickly reduce collective and get it back on the ground without any damage, but that experience was a real shocker.

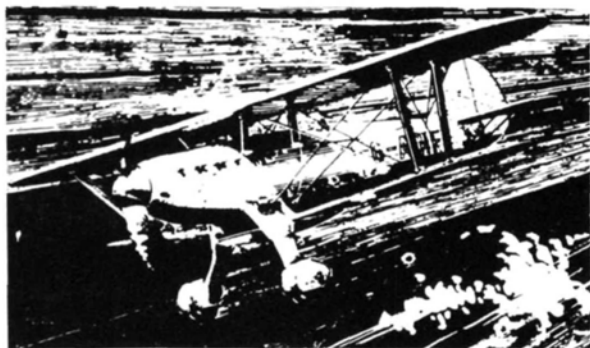
When checking the radio installation, pushrods, bellcranks, ball links, etc., I couldn't find anything that was obviously wrong, so I concluded that the standard pushrods may not be strong enough to withstand the higher loads of the four rotor blades. I've never had any problem with the normal head of the Scout 60, but I suspected that the pushrods were the culprits. On a quick trip to a local bicycle store, I found heavy-duty bicycle spokes for 15 cents each. These were easily cut to the desired length and then threaded. The ball links were also drilled slightly to accept the larger-diameter pushrods.

With that problem supposedly fixed, I was ready to start some serious flying. I brought the Scout 60-4 into a hover, but, once again, after just a few seconds, the violent blade-out-of-track problem was apparent. Fortunately, I wasn't too high, and I was able to land the machine safely. But now what could be the problem?

Since everything else looked OK, I thought I might have a defective collective servo, so I replaced it. No change! Since trying different servos with the heavy-duty linkage made no improvement, I thought there was a problem with the bellcranks or some other slop in the control system. Again, I could find none; and remember, this entire system was working perfectly on the Scout 60 when using its normal rotor head.

Since I was getting nowhere fast using logic, I decided to put the Scout 60-4 on the workbench and turn on the radio as if I were flying. But rather than having air loads on the rotor blades, I twisted them with my hands as if they were in flight, and, lo and behold, the swashplate could

(Continued on page 127)



Golden Age

by HAL "PAPPY" deBOLT

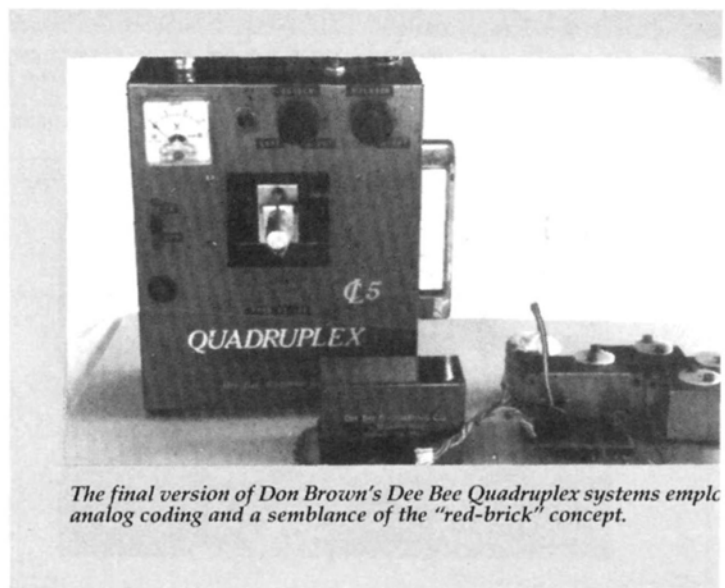
IN MY LAST ARTICLE, I finished my discussion of the Space Control system and its major affect on R/C, and it seems appropriate to continue this train of thought by looking at the other analog systems that were offered. I'm indebted to readers for some of this information. Active R/Cer Allen Knight of Woodbury, NJ, has provided extensive catalog sheets, etc., on OT R/C equipment. He included rare info on the Sampey systems, and I'll be using this—most helpful!

Dr. Michael Shabot* of Palos Verdes, CA, is establishing a museum of OT R/C systems. His current lineup is extensive and impressive, and it's also growing steadily. Dr. Shabot was kind enough to photograph pertinent systems for us, and he's searching for OT R/C systems of any kind to add to his collection, so if you have an appropriate system, please contact him.

Recently, I discussed Don Brown's Quadraplex multi-proportional systems, thinking that these adaptations of the "pulse mode" were probably the first multi-propo commercial systems to be offered. Dr. Shabot reminded me that the last Quadraplex system to be offered was an Analog labeled CL-5 using feedback servos. Again, since it wasn't widely used, we have little technical data, but we see some noteworthy and unusual features in the instruction manual. Don Brown was noted for producing reliable equipment: first, a basic 4-channel system with independent propo control of the fundamental functions. Apparently, unlike Space Control, all channels used analog coding. From the stability standpoint, it's interesting to see the *same circuits* and components used in both the transmitter and receiver to code and decode the tones. The idea was that temperature shifts should affect both circuits in exactly the same way, i.e., if you didn't get into the shift in temperature with altitude! Like today, there were separate trim controls for all basic functions. As a single-stick transmitter, the stick gimble was said to



Above: We unfortunately no longer have prestigious pattern meets like the Detroit Invitational. This is the first USA-FAI team at the 1960 event. Planes would suit the modern scene? Photo by Ken Taylor.



The final version of Don Brown's Dee Bee Quadraplex systems employed analog coding and a semblance of the "red-brick" concept.



be the most precise. Unfortunately, locating the trim controls for convenient, independent left-hand operation had yet to be accomplished.

Don Brown was an active, accomplished contest-oriented R/C modeler. As such, he was cognizant of what was needed for competition, but, as now, improvements often served average fliers just as well. The auxiliary functions of the CL-5 reflect Don's awareness and flying experience.

Walt Good had invented an electronic brake for R/C use. In those days, brakes were needed for the required ground maneuvers. As marketed by Ace R/C, Walt's brake was the most convenient type available. Basically, it was an electromagnet with an inner core that was fixed to the axle; an outer shell revolved around the core and was attached to the wheel. A couple of pen cells provided the power, and a switch energized the magnet. You couldn't "skid" the tire with this brake, but there was ample power to hold a model in place at low throttle.

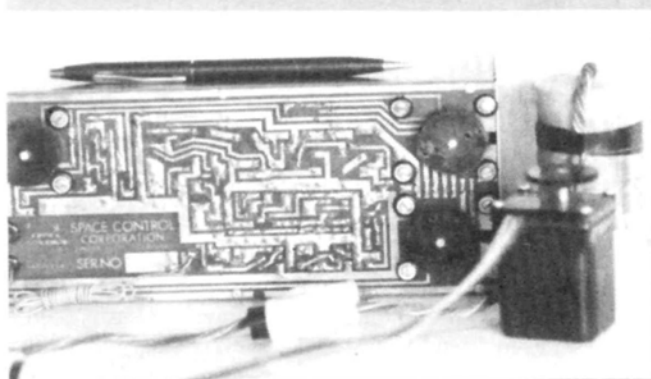
In the CL-5, you could use this brake

with an auxiliary push button. With this feature, you set the engine servo for a desired taxi speed, and when the auxiliary switch was activated, the engine servo would simultaneously go to full low and the brakes would be energized. The CL-5 even provided a separate power circuit for the brakes!

Today, we have high- and low-rate switches. These are an outgrowth of what used to be called a "spin button." Using the spin button, you first set up the controls for spin entry, then, just as the model was ready to enter the spin, you pushed the spin button. This added up-elevator and "bumped" the model into a more positive stall at just the right time to ensure a true spin. A later variation also simultaneously increased the rudder throw. The spin button might have originated with the CL-5; at least, these auxiliary functions reflect the extensive thinking behind this design.

Don Brown apparently appreciated the Space Control concept and the idea behind the "red brick." The CL-5 servos were attached to a mounting board, then

(Continued on page 128)



gold brick" Space Control airborne system. Note the exposed PC board. Photos by Dr. M. Shabot.



The ultimate Space Control transmitter. This one is new and has a unique story. (See text.)

Pattern Matters

by MIKE LEE



Now here is a real pride and joy. This Tiporare is as well finished as any AA Fueled Funny Car on the show circuit. The pilot, known only as Terry, put some long hours and hard work into this bird.

OUR CONGRATULATIONS to the winners of this year's AMA Nationals. Top gun in the prestigious FAI Class was previous Nats Champ, Chip Hyde, of Yuma, AZ. Even though still in his teens, Chip has been a top competitor for some time. He reminds me of another young man who burned up the skies at the Nats about 15 years ago. From Florida, young Rhett Miller retired from the pattern wars as a national champ, heading off to study medicine. I think he's now flying again, but not quite as intensively as before. Meanwhile, Chip still has plenty of time to further sharpen his skills, as he looks forward to the 1989 World Championships.

In 2nd place was Canadian Ivan Kristensen, followed by David Von Linsowe, Mike McConville, Dean Koger (my teacher), and Quique Somenzini. Until this year, Quique was relatively unknown on the national scene. Nice going! There were 53 entrants in FAI Class—more than in any other class, except Sportsman Class. If you think that FAI isn't serious, think again; it's here to stay.

Top among the 21 entrants in the Masters Class was David Hoppes of Spartanburg, SC, and he was followed by Bryan Henderson, Tyler Stuart, Cliff Atkins, Bob Lane and Charles Lewis.



A close-up of the "Tricky Terry" shows some excellent workmanship in a paint job. This is what custom painting is all about.

Expert Class was won by Richard Fletcher of Port Washington, NY, and Merle Hyde (Chip's father) won in Advanced Class. Sportsman Class was won by James McMasters of Texarkana, TX, who beat more than 65 other entrants. In all, 171 pattern pilots saw action in Tidewater, VA. Last year, the Masters Tournament was held there, and there's no doubt that the site is ideal for pattern.

Plane View

On the tech side this month, let's look at something the Air Force has been trying to hide for years—aircraft! Though the Air Force wants "invisible" planes that can't be detected by enemy radar, we don't want to lose sight of *our* aircraft. We want highly visible ships to ensure that we can see their attitude while we perform maneuvers. Scientifically designing and coloring a plane for optimum visibility can mean the difference between good scores and destruction.

Being able to see an aircraft in flight,

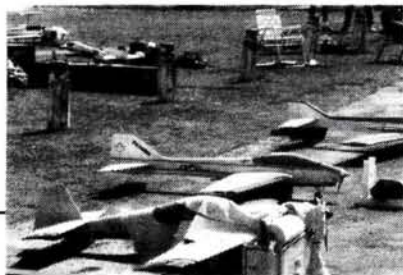
particularly at a distance, is critical to controlling it. On the flight line, we've all heard the story about the pilot who walks over to pick up the pieces and says he was disoriented. He couldn't see the attitude of the ship until the earth got in its way! For this reason, planes should have highly visible color schemes, and, by trial and error, pilots have gradually discovered which colors they should choose, and which they should avoid. They've found that putting on the colors in a certain design order helps them to tell the top from the bottom, the front from the back, and the left side from the right side.

Black is the least suitable color, as dark colors tend to recede into a silhouette in the sky, making identification of the ships' attitude very difficult. (I refer to aircraft finished $\frac{3}{4}$ or more in a dark main color.) Even highlighting stripes or trim won't offset the overall effect of a dark color scheme. Also avoid using these as your dominant color: dark red, dark blue, gray (any shade) light blue and white.

You'll notice that I include two light colors, as well as *any* shade of gray. My reasons should be obvious: A gray plane at a distance will either become a silhouette or will disappear completely, and that's why fighters are painted in shades of gray. (Ask any Air Force pilot.) Using light blue is just asking for it, and an all-white scheme is as bad as all black against anything except a very bright blue sky.

A highly visible aircraft usually has a combination of contrasting colors with distinguishing designs that facilitate identification. No matter what the color, a monotonic color scheme isn't easily seen, and it also lacks eye-appeal. Ships with contrasting colors—even badly painted ones—look better than some solid-color planes with A-1-type finishes.

For high visibility, use a light basic color (like white or yellow) accented with other colors to identify the wings and the tail. I like the leading edge of the wing to contrast with the main part of the wing, as



The Summit by Ivan Kristensen is very simple in color, and works well in the bright sunlit skies. But, many pilots would have trouble seeing this beauty with its mostly white and blue color scheme.

this helps you to determine the wing attitude for straight and level flight. It also helps you determine the wing attitude when in knife-edge flight, e.g., the four-point roll.

My recent fuselages have a color separation at the midline, using contrasting colors for the top and bottom of the ship. Again, this helps to maintain attitude; in particular, that of the nose and tail. For most pattern pilots, the prospect of determining whether the aircraft is upside-down or not is no big deal; by the time you reach Sportsman, you know when the pilot is hanging by his straps. However, for non-competitive pilots, getting used to upright and inverted may very well be an orientation problem that could be helped by using two colors to separate top and bottom.



Black-and-white photo does no justice to Deano Perra's Zlin 526. This ship is highly visible with its yellow background with contrasting red and black trim.

Finally, the use of color on the canopy: Whether we realize it or not, we do take more than just a casual look at the vertical stab and canopy to help us determine attitude. As you fly, there's a familiar "growth" on the tail and a dark spot up front that's supposed to hide the pilot. Take away that dark spot, and you'll be surprised how much you start scanning the rest of the plane for reference points. So I simulate a tinted window with my canopy scheme, and I can see it easily.

Of course, your stand-out plane will also look quite distinctive to the judges. At one time, I used very little contrast in my paint schemes in order to "stealth" my way past the judges occasionally. Unfortunately, the plane "stealthed" its way past me a few times, too, so although I



A good-looking Tiporare by Steve Ojnejik of San Diego is simple, yet easily seen in the air. Pilots must be able to see to fly.

built a lot of planes during that time, I had little to show for it but wreckage! It's obvious that as you get better at identifying your plane's attitude, you'll fly better and your scores will improve, too.

Tire Tip

If you use foam-rubber-type tires, but find that they wear rather quickly, I have a suggestion for you. If you like the rims on which the tires are mounted (particularly the Tetra rims made of aluminum), you can replace the worn rubber quite cheaply. Look in the R/C car section of your hobby shop, where you'll find Associated Electrics* foam tires for cars. These come in various degrees of hardness, are available already cut and trued for cars, and they'll easily fit aircraft rims. To remove the worn rubber, soak your old tires and rims, overnight, in a jar of mild solvent. Next, apply standard, rubber contact cement and an Associated tire inner to the rim. Allow this to dry for about 15 minutes, then wet the rim and the cemented area of the tire with turpentine or alcohol. Now slip the tire into position over the rim and allow it to dry overnight. The next day, chuck the tire and rim on an axle shaft mounted in a drill. Using 280- to 350-grit sandpaper, carefully shape the tire, and soon, your new tires are ready to fly, at a cost of about \$5 a pair. (Compare that price to the \$30 a pair you paid for the rims.) You may find that the tires last a lot longer, too, so try it sometime and let me know what you think.

**Here is the address of the company mentioned in this article:*

Associated Electrics, 3585 Cadillac Ave., Costa Mesa, CA 92626.

Harley's AMAZING Hinges!

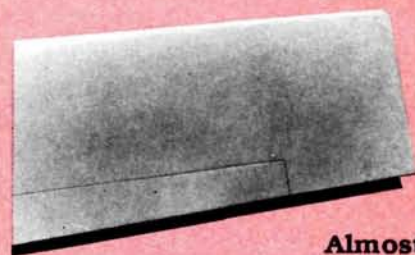


Harley's "Amazing Hinges" were featured in the July, 1988 issue of Model Aviation. Now everyone can have gapless surfaces on their aircraft that not only enhance the performance, but also the looks of your aircraft.

These unique hinges are made from latex rubber! The hinges are installed with a small amount of tension that pulls the surfaces in contact with each other. This tension helps return the surface to neutral and helps to avoid flutter.

Surfaces can be butt-fitted. Spacing, rounding or beveling for deflection is **UNNECESSARY!** Surfaces pivot at their edges as the hinges stretch.

Harley's Hinges work in open or



Almost invisible hingeline

sheeted frames, skinned foam or solid balsa. They work in tapered and constant chord structures. They work well even if **misaligned!**

The hinge size is adaptable to the size of your aircraft.

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Easily installed using tools and CyA that you already have.

Perfect for all aircraft, especially sport and performance sailplanes.

Enough material is provided to make approximately 72 hinges 1/2" wide x 1" long. Detailed and fully illustrated instructions included.

50L317 Harley's Hinges\$1.49

Where can you get 'em?

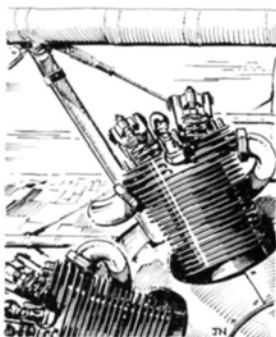
At any Ace R/C Dealer, or directly from Ace
(add \$2.00 Postage and Handling)



ACE R/C

116W. 19th St., P.O. Box 511C2, Higginsville MO
64037 (816) 584-7121 FAX (816) 584-7766

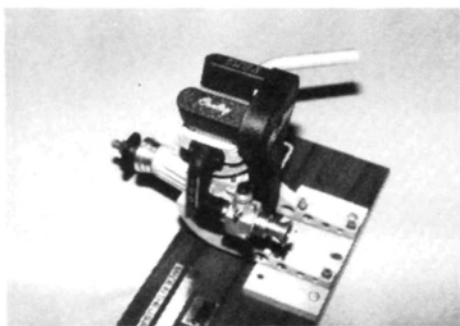
Complete Catalog \$2.00



Four-Cycle Forum

by CHRIS ABATE

SO WHAT'S NEW in the world of 4-strokers? Well, at the recent Chicago Model Hobby Show, Gary Conley, owner of Conley Precision Engines, Inc.*, displayed his 1.2ci DOHC (dual overhead cam) 4-stroke engine. The first item of interest is the belt-driven, dual, overhead cam system. This, of course, eliminates the need for pushrods and rocker arms. The other distinctive feature is the four-valve cylinder head (two for exhaust and two for intake), which aids engine "breathing." It weighs approximately 34 ounces, has 2hp and an rpm of 2,000 to 12,500; stroke is 1.029 inches and the bore equals 1.220 inches. Performance data provided by the manufacturer: 14-8 prop, 10,200rpm; 15-8 prop, 8,800rpm; 16-8 prop, 7,900rpm. (All props were Zinger*.)



The Conley 1.20 DOHC 4-stroke.

Gary was very eager to point out that obtaining replacement parts wouldn't be a problem, because they're produced in the U.S. A more detailed report on this engine will be presented in the future, after I've run one on the test bench.

Quieting a 4-Stroker

From Davis Diesel Development* comes a muffler designed for use with your 4-stroke engine. The basic idea behind this system is that, using brass tubing, you lengthen the header that comes with your engine to a length that's best suited to your engine, and attach the muffler to the end of the brass tubing. By now, you

should be getting the idea of a tuned header pipe; different lengths will give different results. You will be trying to achieve the lowest dB reading with the highest rpm.

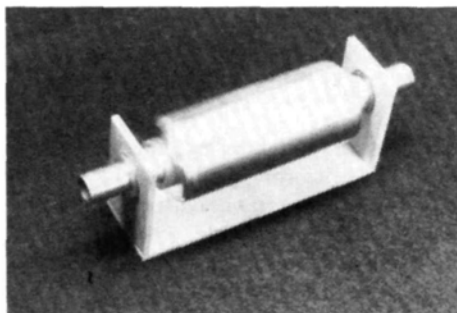
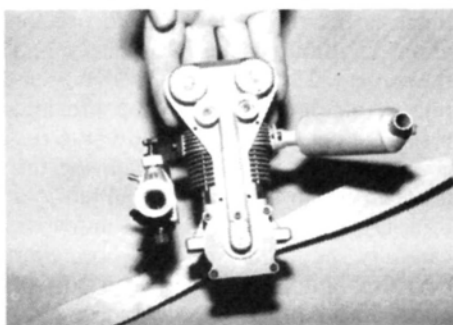


Photo depicts a plywood muffler holder for the Davis Diesel Development SM-4 muffler. How to make it is fully explained in the instructions.

The instructions fully explain how to attach the system: Go to your local hobby shop and purchase a length or two of brass tubing, which just slips over the exhaust header of your engine. This is then either silver-soldered or clamped to the header. If you don't want to silver-solder the brass tube to the header, make three equally spaced slits at the end of the brass tubing, slip it onto the header, and secure it with a small, metal, hose clamp. (Either method works well.) The muffler,



Conley's 1.20 4-stroker provides easy access to camshafts and valves once covers have been removed.

which measures approximately 5½ inches long and has a diameter of approximately 1⅝ inches, attaches to the brass tubing with the high-temperature rubber tubing

and clip rings that are supplied. From this point on, it's a matter of determining the proper length of the brass tubing; I started with a 12-inch length using O.S.* 1.20 and Saito* 1.20S engines. As the instructions stated, for a 1.20, as much as 12 inches may be needed.

See the chart for the results; all header lengths are brass tubing, as is the header supplied with the engine. The tach used was the Futaba* F.P.-DT1, the sound-level meter, or dB meter, was from Radio Shack (Model No. 33-2050), and the prop was a DW 14x10.



Greg Armbruster's O.S. 48 Surpass-powered Sig Smith miniplane.

I've been getting a lot of questions about the sizes of different 4-stroke engines, so I thought it would be a good idea to include the dimensions of an engine with each column. This may answer your questions, if you're concerned about whether or not an engine will fit into the plane you're building.



The Davis Diesel Development SM-4 muffler; clamps and hose supplied.

With that, let's start with the Conley 1.20 4-stroke, and up and coming...how to get reverse rotation from Enya 4-strokers.

	LENGTH	RPM	dB LEVEL
O.S.	Stock Muffler	8800	101
	6 inches	8400	97
	9 inches*	8600	97
	12 inches	8400	97
Saito	Stock Muffler	8800	100
	6 inches	8300	97
	9 inches*	8600	97
	12 inches	8400	98

*In both cases, the 9-inch lengths produced the best readings (with the O.S., a decrease of 4dB with only a 200rpm drop; the Saito decreased 3dB with a 200rpm drop).



The dual overhead cams are belt-driven. Note side-mounted carb.

*Here are the addresses of the manufacturers mentioned in this article:

Conley Precision Engines, Inc., 8200 Ridge Ave., Suite G, Dept. T, Lombard, IL 60148.

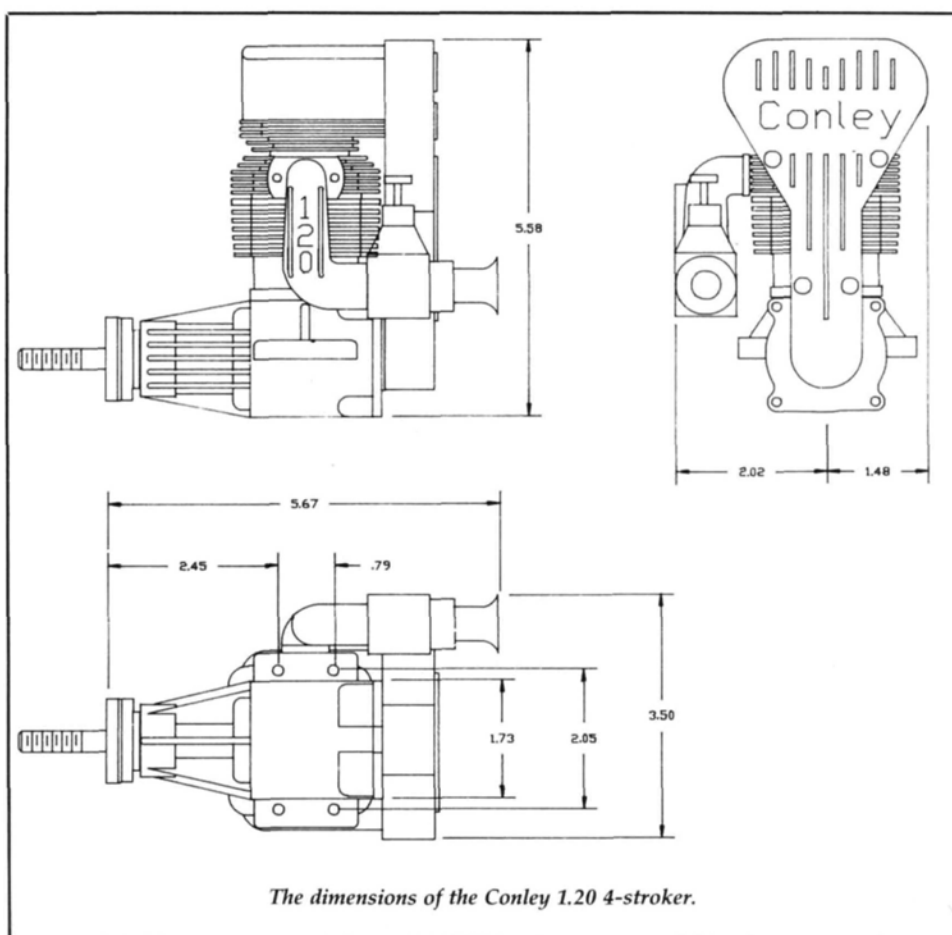
Zinger, distributed by J&Z Products, 25029 S. Vermont Ave., Harbor City, CA 90710.

Davis Diesel Development, P.O. Box 141, Milford, CT 06460.

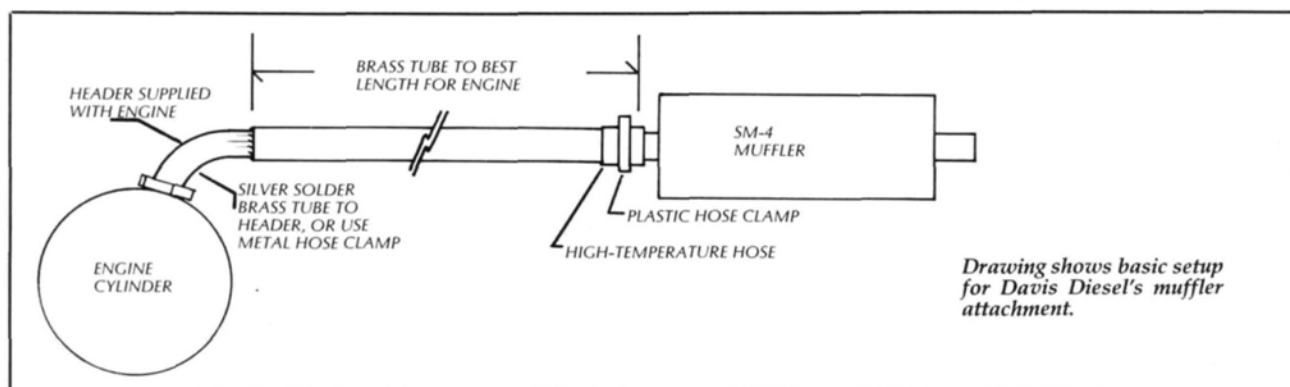
O.S.; distributed by Great Planes Model Distributors, P.O. Box 4021, Champaign, IL 61820.

Saito; distributed by United Model Products, 301 Holbrook Dr., Wheeling, IL 60090.

Futaba Industries, 555 West Victoria, Compton, CA 90220. ■



The dimensions of the Conley 1.20 4-stroker.





Helicopter Challenge

by CRAIG HATH

IF YOU'RE A NEWCOMER to the sport, you might be considering buying your first model and the necessary support equipment or perhaps you've recently acquired your first machine. When they're considering a specific kit, beginners usually ask what types of scale-body kits are available for each particular machine. Adding a scale-body kit to your helicopter (when you've reached the level of proficiency that warrants it) is a goal of many people. However, you might cheat yourself in the long run, if you buy a model just because it has an available body kit of a certain full-size helicopter. Your primary concerns should be finding a model that will be easy to build, maintain and repair, and will also be a stable flier. For instance, just because you want to build a model of a helicopter that uses a flybarless rotor head (most full-size helicopters do), you shouldn't buy a kit with a flybarless rotor head. You could probably learn to fly with this setup, but, in most cases, it will take longer to master the basics, and the helicopter will require more attention to detail during construction and maintenance. A flybarless rotor head will usually require blades that have been carefully balanced and weighted, and the control response in flight is often more sensitive than that of a machine using a flybar-type of rotor head.

Most models now available are suitable for beginners, but they must be configured so that they're sufficiently docile and forgiving to allow for mistakes. In addition, body kits for any specific brand of machine can often be modified to work with other brands of helicopters. If in doubt, check with the manufacturer of the scale-body kit that interests you, and ask if the body can be used with other brands of models. As a last resort, you may consider selling your trainer when the time comes to move up to that dream machine. At any rate, don't sell yourself short. In the beginning, con-



If you don't feel comfortable standing still and flying around yourself, try following your machine, as Jerry Lusk demonstrates in this picture. Try to relax, and concentrate on your flying.

cern yourself with learning to fly and learning the fundamentals of the sport. You'll get to the other end of the rainbow in a heck of a lot less time if you don't take any short cuts.

I left off my series about flight basics with practicing slow, moving circles about 3 feet off the ground. By this time, you should be able to maneuver your machine around in this way pretty well. Until now, we've intentionally avoided holding the helicopter in a stationary hover because hovering is much more difficult than moving the helicopter in a certain direction. To hover the helicopter in one spot, you'll have to make continual small corrections for drifts in direction. You'll also need a grip on tail-rotor control and collective pitch. The bottom line is that there's a lot going on with the sticks that makes the machine appear to be doing nothing! Of course, you may be

lucky enough to have a machine that will hover practically hands-off. However, I've found that beginners' equipment is normally a little off-track, due to their lack of experience in fine-tuning (unless, of course, they've religiously followed our series on trimming!).

If you've mastered maneuvering your machine through circuits of left, right, fore, and aft circles, and feel confident with them, it's time to move on to hovering. At first, I sneak up on it. For example: While flying your machine through a slow right-hand circle, gently begin to pull back on the pitch-cyclic control until the helicopter stops. Be sure to ease up on the control before the helicopter begins to back up. This step requires a light touch on the sticks, so be careful not to over-control the machine. As the helicopter comes to a full stop, try to hold it perfectly still just for a moment.



Notice the base-loaded transmitter antenna on Frank Dykes' JR PCM 9 transmitter. The advantage of this is that you can avoid accidentally poking into objects of a foreign nature! Should be available from your local dealer by the time you read this. JR recommends that this item only be used with helicopters, as there could be a slight loss of radio range.

Now, push forward cyclic and re-enter the circle, allowing the helicopter to move forward a few feet. Repeat the process until you can accurately start and stop the motion of the helicopter at will. As you become more proficient, try moving the helicopter from side to side, and then back it up, always stopping it completely before changing directions. Test yourself to see how long you can keep from having to land the helicopter.

Working with these maneuvers, gradually increase the length of the hovering period. You should be able to keep the helicopter in a stationary hover for increasingly long periods. You should reach a point where you're theoretically capable of holding the helicopter in one spot for a whole tank of fuel. As you spend time hovering, your machine may need a little trim for one or more of the controls. If so, land the machine and make the needed adjustments to get it as close to a hands-off trim condition as possible. It isn't uncommon for the helicopter to change trim from one flight to the next, or from one flying session to another. Atmospheric conditions change, causing slight differences in trim, or a trim lever can be inadvertently moved. Trimming your own machine will give you confidence in your abilities and some independence from your instructor.

So, finally you're hovering! Now you're capable of controlling your machine well enough to lift it off the ground, hold it in one spot, move it in any direction, stop it, hold it there, and on and on. No real magic is required to hold the helicopter still at this point, because you've laid adequate groundwork.

Learning to fly a model helicopter requires the training of eye-to-hand responses, and it involves some "muscle-memory development." It's like some other activities, e.g., developing a golf swing, or throwing a baseball. Your basic abilities will become deeply ingrained, but you'll have to practice and work at it



Ken Wilson's technique for practicing hovering climbs and descents. Try to keep the helicopter under 12 feet.

to develop finesse. Finesse will seem to come and go—especially if you can't fly as often as you should to make progress. As I've always said, you must challenge yourself constantly. Too many fliers arrive at the field with their first machine and spend all their time trying to hover. When they can hold the helicopter off of the ground in one spot, they're stuck there. It almost seems as though they're petrified to touch anything. They just haven't learned to fly the helicopter. If you follow the steps outlined here, you'll soon be ready for forward flight, nose-in hovering, aerobatics, and so on, because you'll have taught yourself the basics of flight control.



The author flying the helicopter through a hovering circle. If you can, stand in one spot, and fly the helicopter from one side to the other. Avoid pointing the nose of the helicopter directly at you.

After hovering, work on short climbs and descents. Start with the helicopter hovering at about 3 feet, and gently increase the throttle/collective to allow the ship to reach an altitude of about 5 or 6 feet. When the helicopter reaches that altitude, start reducing the throttle/collective to begin a gentle descent. As the machine nears the 3-foot mark, feed in a slight amount of collective/throttle to stop the descent, and then return to hover. Work with this until you feel comfortable, then start increasing the height of the climb a little at a time until you get the machine up around 10 to 12 feet or so. Be careful not to get directly under the helicopter as, if you do, it will be difficult to judge how the machine is reacting, and it's easy to become disoriented.

As you perform these more complex maneuvers, remember that panic is your worst enemy. If you get into trouble, do not immediately chop the throttle. This is a common knee-jerk reaction that usually stuffs the helicopter into the ground. It's far better to slightly increase the throttle while attempting to recover from your mistake. Try to "play" the throttle so that you don't gain too much altitude and get yourself into more trouble. At any rate, if you've practiced all the steps that we've been working on, you'll be prepared to handle this situation.

That just about wraps it up for this month. If you're fortunate enough to live in an area where you can fly during the winter, try to get out often and build that "muscle memory." If not, try a little "chair flying" from time to time, and imagine your helicopter is performing all the maneuvers that you're capable of—and more. This may sound silly, but many champions use this technique to keep themselves sharp. Try putting your machine on the coffee table while you kick back in your easy chair and fly away!

Next month, we'll step into the realm of forward flight, so *stick around* until then!

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LEN MOUNT

(Continued from page 65)

would have been in the drink! I told the pilot just to follow the beacon, and he said that he didn't have "that type" of radio equipment! This, indeed, worried me, because of all the money and time I'd invested. In the middle of a thunderstorm, we landed in France (45 minutes late) and everyone was worried. The airport we planned to land at in England refused us permission to land because of the 35mph winds and 200-yard visibility! We thought, "All this way, for nothing!" We persuaded the airport in France to stay open, but they charged us \$60 an hour. Hurriedly, we called the English airport, which was then all clear, and visibility was 1/2 mile.

At this time, it was still raining—I mean torrential downpours and thunder. The Hughes 500 we were in had become very wet inside because we'd left the door in England! All the carpets and seats were waterlogged. Then everybody wanted a photo call, so I got everyone I could find to sit in this wet Hughes 500 to have their photographs taken. They didn't realize why I was doing this: It was only so they could soak up all the water in the seats so they'd be dry for me! I'm not stupid, you know, and I had a virtually dry seat to fly from!

Before we took off, the pilot asked me at what height I wanted to fly, and I said that between 400 and 500 feet would be fine. So he took off, and within seconds, this guy was at 500 feet. My little helicopter was still only 4 feet off the ground! The model just refused to climb; it just hung there for about 5 minutes skimming the ground, and, just when I thought it was over, it came alive, pulled itself up and said, "Hello, I'm waiting to go."

The model was angled 45 degrees across the English Channel. I decided to open up the throttle all the way and just fly the cyclic control. Since I was always in constant communication with the "full-size" pilot, he could always tell me our speed and altitude. We covered 38 miles with no real problems. It was so exhilarating! What an experience!

Tim: Congratulations Len! Tell us about the equipment you used.

Len: The helicopter was a reworked Schluter Champion in an LM Ranger (Len Mount Ranger) configuration. It had a TSK tail-rotor gearbox for lightness. Everything else, as I said earlier, was made of really light material. There were so many holes in the main gear, it looked as if mice had got to it! The radio was a standard JR. There were holes in the servo cases, and there were only two screws instead of four

screws holding them in. Everything was whittled down: The receiver didn't have a cover on it, there was no switch, and we didn't use a gyro. Flying without a gyro was the hardest thing. Now I practice without a gyro, and I'm looking forward to winter because, when all the leaves are off the trees, I go through the forest with chalk and mark several trees as I walk. Then I fly around these trees with no gyro on! It's great training. Rossi supplied a standard hand-picked .60 engine, which we put on the bench to break in and ran for 4 hours, full-bore. For fuel we used 6 percent synthetic, 2 percent castor, and 3 percent nitro. (We used so little oil because we wanted the power and economy.)

Tim: Thank you Len; you're invited back to the United States any time!

Len Mount is currently practicing with a new helicopter, and we should look for him at the 1989 World Championships in Virginia. ■

GIANT STEPS

(Continued from page 48)

Steady as a rock under the expert hand of Jim Allen, the model performed in a truly amazing fashion and impressed all who saw it fly. Without a doubt, those who've seen the engine perform have witnessed the dawn of a new era in aeromodeling.

The absence of ear-splitting noise from this engineering feat is amazing. Past experience with jet-based model engines has left us expecting a great deal of noise—not so in this case. At a distance, it's inaudible, and close up, all you can hear is a soft, not unpleasant whistle. The intake opening is unusually small and the throttle function performs perfectly. The entire project is a tribute to the skill, knowledge and dedication of the project team. Jim Allen is a pilot of superb skill and ability, and watching him fly this breakthrough in model technology was a delight.

Mel Barber from South Africa seems to have a masochistic tendency: His models are often of older airplanes that require considerable amounts of wire bracing. This year, Mel appeared with a Lincoln Beachey Looper—a model that uses more wire than anything I've ever seen. The original airplane is supposed to have been the first to perform a loop. Mel's model is true to scale—no mean feat, considering the apparent miles of wire used to brace the model. In addition, balancing the model for flight required adding extremely heavy footrests for the model pilot and water inside the nose

wheel, an ingenious solution to the problem of having to add weight forward. (Mel added over 4 pounds to the nose to keep it balanced.)

In the past, Mel has had his problems at Las Vegas. He's had models stolen while en route from South Africa; he's had many engine problems; and he usually finishes his models *just* in time to meet his flight schedule. This year was no exception, as Mel once again had a problem with engine performance. This was apparently caused by a very thin gas/oil mix, which resulted in engine overheating and loss of power. A more reasonable 20:1 mix helped to correct the problem, and Mel not only took home the trophy for the longest distance traveled (which he's won for many years), but also took Best of Show.

In the area of electric power, Addie and Tony Naccarato were at the forefront once again. Their electric-powered models never cease to amaze those who see them fly. This year, they presented a B-36 powered by electricity, and it was a fantastic demonstration of the development of electrically powered models. If such a large B-36 can be flown electrically, there's no limit to what might happen. Once again, Addie celebrated her birthday at the Rally and her many friends wished her well for many more to come.

Generally, the quality of the models shown at Las Vegas has improved dramatically over the years. I've attended nine of the 12 rallies, and the ingenuity, workmanship and quality of finish have come a long way during that time. Many of the models are close to museum quality, and most of them are flown. There have been exceptions to that, of course; in my opinion, however, if it's a model of an airplane, it *should* fly, and if it doesn't (or isn't intended to), it doesn't warrant much attention except as a static model. In the past, there have been a number of what we might call "hangar queens," but in recent years, almost all the models have flown.

As an added attraction, many of the models were of antique and classic airplanes. There have been several Nieuports; Forest Edwards and his amazing engines were fitted to a pair of Polikarpovs this year (both extremely well-done); Noel Hess brought a replacement for the Waco he sold recently; Jim Johnson has refinished his very large Waco YMF-3; the list seems endless.

Friday, Saturday and Sunday were flying days at the lake bed, which lies between Las Vegas and Boulder Dam. The dry bed is about 5 by 10 miles and

absolutely flat. The surface can be a little rough, depending on the weather, but it was smooth and in good shape this year, and the weather was extremely warm, with temperatures in the 80s. The only problem was afternoon wind, which created dust and visibility problems, and gave smaller and lighter models some trouble. When the wind blows strongly across one of those lake beds, the dust is worse than a northeastern fog, and it doesn't evaporate. You have to remove it from *everything* you own. Getting it out of a camera is no fun at all!

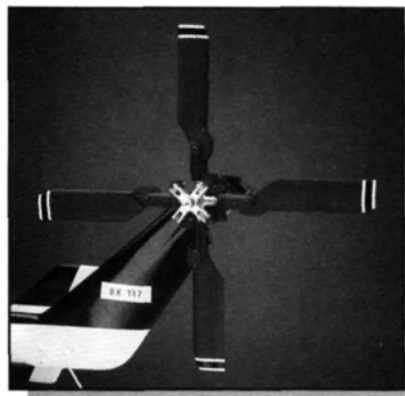
While walking the line one afternoon, I ran into good friend Ron Karwacki, of California. Ron said he had an airplane he wanted me to see, and I expected to see a model he'd brought, but was delighted to find that he wanted to show me his 1:1 Cessna 195, which he's been restoring for some time. The airplane looks great, and when Ron offered me a ride to get some aerial shots of the flight line, I was right at the head of the line. I've always wanted a ride in a 195, and Ron provided a memorable, albeit short, flight for me. Thanks to Ron for the ride and for the first aerial pictures I've taken at Las Vegas. Why no one has modeled the 195 at 1/4 scale amazes me; it would be a superb model and would fly well on several of the available engines. Anyone know of a plan for such a model?

The flight line and spectator area stretch for almost a mile along the lake bed. Every known variety of recreational vehicle showed up, and a small city blossomed for a few days. Flight control was handled very well, with several flight lines. The large number of flights made, and the number of different models and radios creates a potential problem. I saw only two crashes this year and attribute this safety record to the excellent system. Not a small part of this record was checking all the radios. The number of radios that failed to pass was extremely low compared with what we've seen in the past (something like 2 percent), which indicates that our radios are getting better and that we're becoming more safety conscious too.

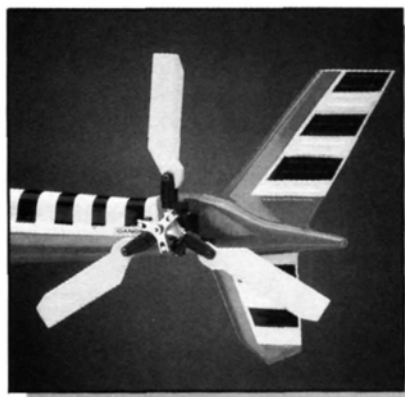
At the banquet on Saturday evening, recognition was given to those who have contributed to the increased popularity of large models. This year's event was dedicated to the memory of Eddie Morgan, and a moving tribute was paid to Ed by members of his family, his friends and QSAA. A plaque was presented to his wife, Lupe, in recognition of Ed's contribution to the large-model movement, and of the esteem in which he was universally

(Continued on page 104)

MULTI BLADE TAIL ROTORS



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WARBIRDS

UNLIMITED

1 9 8 8

These R/Cers appear to have miniaturized Reno and moved it to Missouri!!



Paul Geder's A6M3 Zero.



Bob Bennet's F6F .90 4-stroke-powered; British Navy markings.



Ray Williams' P-51 Candy Man from the House of Balsa kit.

by JOE LUNT

IN 1979, FOREST TRENT, a hobby shop owner at the time, suggested that competitions needed something new to draw scale contestants. "Reno-style racing," he said. "Static-Scale judging as half the score, and pylon racing making up the other half; this would ensure that excellent scale aircraft would compete."

His idea was presented to the members of the Spirits of St. Louis R/C Club, and enthusiasm started to build. Club officers appointed contest directors, and, together, they came up with a set of rules that they thought would appeal to scale fliers and racing buffs.

We started with Sport-Scale judging as a must, but there

were no rules to be decided there, as it was already in the book, and not subject to change soon. The racing portion and Static Scale were to award up to 100 points for every contestant's finish in each round, and a fly-off would decide ties. This worked well for a few years, then we tried Head-to-Head Racing (the fastest against the fastest), and now we're into Gold, Silver and Bronze Classes, but that might change.

We found that the wing-area/engine-cubic-inch rule was keeping some Warbird kits out of contention, so we allowed kits using the largest engine suggested by their manufacturers to qualify. However, the kits had to be built according to the plans. Detailing was allowed, as long as the kit platform followed the plans; alteration to the kit platform made the model subject to the wing-area/engine rule.

Our first year brought 12 entrants; the second year, again 12—disappointing, but still not bad for a scale contest! During the following years, entries picked up, rising to 17, then to 21. (That year, Clarence Idoux from Belleville, IL, won all his heats with a high Static score and a fast time of 1.51.45—a record that still stands.)

We like to think we've refined the rules and that no immediate changes will be necessary, but I think the Gold, Silver and Bronze divisions must eventually be changed. The rules, and changes to them through the years, were sent to all the clubs in our district, and to as many clubs as we could find in AMA's contest directory. We started drawing pilots from various parts of the country: Ralph White, (Fliteglas manufacturer) won this event twice, and Hal Parenti, flying the P-39 with which he competed at the Nats, won 1st the year we had no field of our own, but had to "borrow" one from the East Side Club in Illinois. (The next year, we used the Prop Nuts' field in St. Peters, MO.)

This year, our contest seemed to generate more excitement than ever before, because we had a new format for scoring. After registration, pilots roamed around looking at one another's aircraft. Static-Scale judging began with aircraft lined up 10 feet apart and 15 feet from the judging line with their documentation on this line. This year, scoring was copied from the Reno race rules. Pilots were put into Gold, Silver or Bronze groups according to their flight time in round one. During each succeeding round, they moved up or down according to whether their flight times were faster or slower. This meant a lot of bookkeeping for the scorekeepers, but they handled it well. At the end of the races, Static scores were added to flight scores and the totals determined the winner.

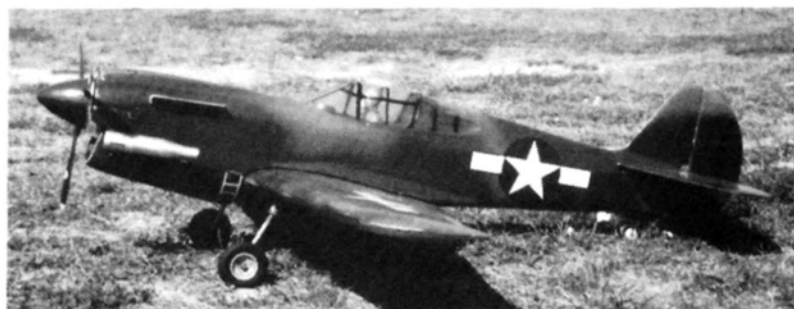
Jim Sprouse, in his first year as contest director, did an outstanding job. The first day (Saturday, September 17) was hot and muggy, but with eight rounds to fly, we didn't wait to start. Yours truly flagged off all heats and we flew four rounds this day.



Shelby Hagberg's Corsair-F4U.



Dan Hahn's P-51 Sweets.



Bud Grider's P-40 Warhawk.



Rich Taylor's Rockwell P-51 duplicates Bob Hoover's aircraft.

WARBIRDS

Fortunately, there were no casualties, and we looked forward to seeing all 16 planes on the following day.

Sunday's weather was a surprise—a

misty rain—and we still had four rounds to go! Despite the rain, the pilots voted to go ahead; the race timers and the flagger weren't allowed a vote (are they ever?).



Bill Mullen's P-51 Lou IV.



Dave Johnson's P-51 Damn Yankee. Black-and-whites don't show colorful red-and-blue cowl.



Bob Lamb's P-51D Mustang. Military schemes are varied and attractive.



Art Biehl's clipped-wing Spitfire had O.S. 120 4-stroke power; rapid performer.

We got in all four rounds, and a wet, excited bunch of pilots gathered around to see who'd won the radios, kits and engines that had been generously donated by hobby shops and manufacturers. (See the Winners Chart.) It's rumored that this year's scoring system won't be used again; the club may go back to "the fastest wins the loot!"

Warbirds Unlimited is still the largest scale contest in the St. Louis area, even though it's restricted to military aircraft flown from 1939 through 1945. Planes can

- | | |
|---------------|---------------------------------------|
| Gold | 1. Charlie Chambers, P-51 Roto Finish |
| | 2. Bill Mullen, P-51 Lou IV |
| | 3. Dave Johnson, P-51 Damn Yankee |
| Silver | 1. Rich Taylor, Rockwell P-51 |
| | 2. Bob Lamb, P-51 Glamorous Glen |
| | 3. Bud Grider, P-40 |
| Bronze | 1. Paul Geders, A6M3 Zero |
| | 2. Art Biehl, Spitfire |
| | 3. Bob Bennett, F6F Wildcat |

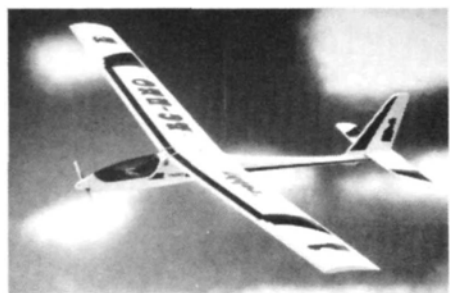
Fastest Time: Dave Johnson, (1.56.05)

Best Static Score: Chambers/Sprouse/Pozarich

have either military or civilian colors, and pilots must have documentation verifying changes made to their aircraft. This sometimes makes for some unusual aircraft on the flight line. We see small canopies, clipped wings and many paint schemes, none of which the designer of the original aircraft even thought of (but the Reno boys did).

After our tenth year of running this contest, we're confident that next year, we'll see something we haven't seen before, and we're looking forward to it. ■

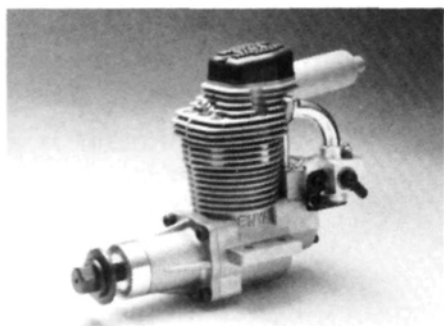
Product News



ROBBE UNO-E ELECTRIC GLIDER

The Uno-E is an ideal beginner's electric glider that can be built in a very short time. Easy to build and easy to fly, the R/C Uno will bring many hours of pleasure. The under-camber airfoil ensures stable flight characteristics. All that you'll need to complete this kit is a 2-channel radio and a 7.2V Ni-Cd battery pack. The kit contains a molded fuselage with pilot figure, ready-made wings, prefabricated tail group components, electric motor, electronic motor timer, prop and spinner, glue, paint and some small tools.

For more information, contact Robbe Model Sport, 180 Township Line Rd., Belle Mead, NJ 08502.



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Noise at the flying field is a serious problem for modelers and local residents. Enya, a leader in model engine technology and an innovator in model engine features, has taken bold steps to develop powerful solutions to the noise problem. The engineers at Enya have spent years researching and testing a wide range of systems that will quiet an engine with a minimum of power reduction.

For more information, contact Altech Marketing, P.O. Box 391, Edison, NJ 08818.



JOHN TANZER 1/4-SCALE PJ-295 PLANS

John Tanzer has just made available Ed Mahler's PJ-295 biplane. The plane has a 64-inch fuselage, an 81-inch top wing, and a bottom wing 71 inches long for a wing area of 1836 square inches. Using engines in the 2- to 3-cubic-inch range, the PJ-295 at 20 pounds is as aerobatic as the full-scale PJ. Some of its features include fast field assembly that doesn't require flying wires, and a full set of high-quality plans consisting of three sheets, shipped and rolled to avoid damage and eliminate creases. Fiberglass cowl and wheel pants are available.

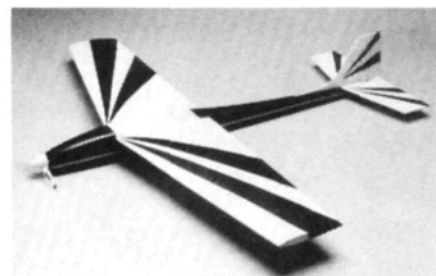
For more information, contact John Tanzer, 166 North Lehigh Ave., Cranford, NJ 07016.



MGA 1/6-SCALE PILOT

MGA Enterprises has just introduced a new World War II fighter pilot. This 1/6-scale pilot is 12 inches tall, weighs 8 ounces, and is available in three different versions: the Aviator (WW I pilot), a Civilian/Sports Flier and the World War II fighter pilot. These pilots are adjustable and authentically dressed in fabric flight suit, boots, a leather flight helmet, goggles, Mae West and parachute.

For more information, contact MGA Enterprises, P.O. Box 5631, Fresno, CA 93755.



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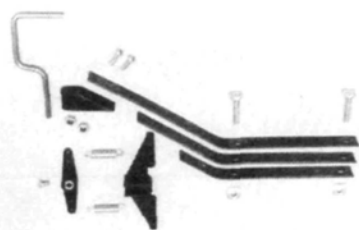
For more information, contact Great Planes Model Manufacturing Co., P.O. Box 788, Urbana, IL 61801.



H&N ELECTRONICS SOLDER FLUX "GEL"

Supersafe Solder Flux "Gel" is just the answer for modelers and craftsmen who want a soldering flux that's safe, clean, easy to work with and doesn't run off on those hard-to-solder places. This flux has the same formula (safe, organic, no rosin, chlorides or other strong acids or acid-forming substances) as Liquid Flux, but it's in a gel form. It's available in 2-fluid-ounce bottles.

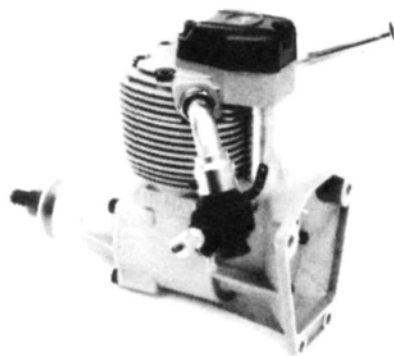
For more information, contact H&N Electronics, 10937 Rome Beauty Dr., California City, CA 93505.



SIG X-LARGE TAILWHEEL ASSEMBLY

This super-strong tail-wheel assembly was developed for giant-size models weighing over 15 pounds. It features a unique molded-nylon tail-wheel bearing with scale-like appearance, hardened spring-steel leaf-springs, complete hardware and a formed 1/8-inch-diameter tail-wheel wire that will accommodate up to 2 1/4-inch-diameter tail-wheels. The molded-nylon steering arm and heavy-duty rudder-control horn are connected by high-quality, coiled, steering springs. The shock-absorbing ability of this unit will ensure years of trouble-free service, even on the roughest flying fields.

For more information, contact Sig Manufacturing, 401-7 South Front St., Montezuma, IA 50171.



HI-MAX ENGINES HI-MAX 91 and 120

The Hi-Max 91 and 120 4-stroke engines manufactured in England are now available through Hobby Lobby. The Classic 91 and 120 have most of the features of the Hi-Max engines but cost less.

For more information, contact Hobby Lobby, 5614 Franklin Pike Cir., Brentwood, TN 37027.



R/B BUNCH HELO-CALENDAR

Hover lovers will enjoy this long-awaited calendar devoted exclusively to helicopters. This 1989 Helo calendar features radio-control and full-size helos and is loaded with information, e.g., trivia, important events, and birthdays of those who have contributed to the advancement of rotary-wing aircraft. Color pictures printed on high-quality stock appear each month.

For more information, contact The R/B Bunch, P.O. Box 27082, Memphis, TN 38127.



GUILLOW ELECTRIC AERONCA

Guillow has introduced an electric-powered R/C Aeronca, designed by "Woody" Blanchard. Each construction kit contains lightweight balsa, a .05 electric motor and harness, spinner, prop, pushrods and wheels. The Aeronca has a wingspan of 67 3/4 inches, and it's designed for a 3-channel radio system and a 8.4V 7-cell battery pack.

For more information, contact Guillow, 40 New Salem St., P.O. Box 229, Wakefield, MA 01880.



BIO-PAK CRAFTIP

The new Craftip from Bio-Pak Associates is a syringe kit that's ideal for craft, hobby and art projects that involve fine, detailed work, or working in difficult-to-reach areas. Glues, adhesives, paints, oils, or almost any kind of liquid can be easily dispensed and precision-controlled from the handy 1/2-ounce-capacity plastic syringes. The Craftip kit includes two plastic syringes; the needle-tip syringe is designed for thinner liquids and includes an airtight cap for safe, convenient storage. The tapered-tip syringe is designed for heavier products, and the graduated, pre-sealed tip can be cut to the required opening size.

For more information, contact Bio-Pak Associates, P.O. Box 2280, 5018 Industrial Rd., Farmingdale, NJ 07727.

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TOP GUN

INVITATIONAL TOURNAMENT
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For more information, call the Top Gun Information Office 9 a.m. to 5 p.m. (E.S.T.) Monday through Friday at (305) 473-2211. Tickets for Dinner & Dance must be purchased before Jan. 15, 1989. Tournament admission tickets will be available at the gate during the competition.



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GIANT STEPS

(Continued from page 95)

held.

After 12 years of good shows, QSAA seems to have found the magic formula for a format that appeals to model builders. Attendance has remained high over the years, and the attractions of Las Vegas provide an incentive for spouses and families to attend as well. Once again, congratulations to the organizers of QSAA Rally '88 for a job well done and for the hospitality extended to their visitors.

F3E CHAMPS

(Continued from page 55)

vided good Ni-Cds. But the Europeans went further: They designed *great* air-planes! In this contest, you could see the progression in European design. There, performing credibly, if somewhat boringly, was the old mid-'70s Graupner Ultra-Fly, and right there with it were the current American designs that look like the old Ultra-fly. These things flew OK (just OK).

However, when the *latest* designs were flown—the F3E planes, Detweiler's Pylon Racer, the Elektro-UHUs (also designed by Detweiler)—the spectators woke up. Electric flight finally had that previously missing ingredient—exciting performance!

CHAMPION 45

(Continued from page 64)

air. A bit of down trim and we were set. The suggested control-surface throws were used, and this proved quite comfortable for sport flying. Aileron requires a bit of offset, but not enough to worry about, unless you're a perfectionist. Elevator response is smooth and immediate, pulling the bird nicely through loops and hard turns; rudder response is just barely adequate for the stall turns, but enough for the knife-edge flight. The rudders also provided neutral roll coupling, allowing a pure crab when wanted. The inverted-flight portion was the *real* treat, as the Champion used just a whisper of down-stick to hold level. We made a few circuits of the field for the cameras, and settled in for the landing.

Landing was sweet, the Champion slowing down nicely and touching down lightly. What a floater! Post-flight inspec-

(Continued on page 106)



JET FIGHTER SHIRTS

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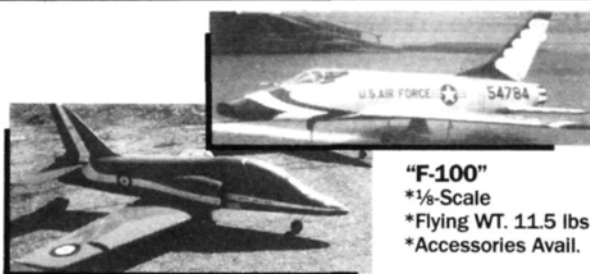
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CHAMPION 45

(Continued from page 104)

tion revealed nothing out of place and everything intact. A couple more flights maintained our initial opinion of the Champion. The Magnum Pro 45 worked this ship very well, and the Champion showed a pretty fast flight capability.

My final evaluation of the Champion 45 is that although it has its rough spots in assembly, it performs well in the air. The flight performance is as advertised, and it can be handled by most sport pilots with low-wing experience. Improvement is needed in the fire-wall department, and the hardware supplied isn't adequate. However, for the price, it's worth considering for your flight stable, as the Champion 45 should fit the sport/pattern requirements of most pilots.

*Here are the addresses of the manufacturers mentioned in this article:

AMS Import/Export, Inc., 1110 S. Wells Ave., Reno, NV 89502.

Varicom Industries, 18480 Bandilier Circle, Fountain Valley, CA 92728.

Zinger, distributed by J&Z Products, 25029 S. Vermont Ave., Harbor City, CA 90710.

Futaba Industries, 555 W. Victoria St., Compton, CA 90220. ■

QUIET FLIGHT

(Continued from page 67)

many other inexpensive, larger motors. The plastic backplate, which is held on by crimped tabs, has generous ventilation slots.

"The motor itself is 1.5 inches long, just over 1 inch in diameter, and it has a small-diameter shaft with a rather long machined-aluminum prop driver pressed on. This prop driver puts the rear face of the prop about 3/4 inch in front of the motor. The mounting holes in the motor's front are M2.6 tapped, and they come with matching screws installed so that "fire wall" mounting can be used. No speed reducer I know of will physically fit it.

"The attached wiring is stiff—18 gauge or so—and ends in a three-pin Deans* connector, with two of the pins used. The motor, as supplied, with wiring and prop adapter, weighs exactly what the manufacturers claim in their ads—2.6 ounces.

"If you acquire a complete system, the rest of it consists of a switch harness of the same stiff wire, a 1/8-inch mini audio jack for charging and the usual red toggle switch, as used by Astro and Leisure. The

(Continued on page 111)

QUIET FLIGHT

(Continued from page 106)

battery in the system supplied to us was a 6-cell pack of Sanyo* AA cells of 55mAh capacity (the same cells used in many transmitters). Also included was a Rev-Up 6x3 prop. With this pack, switch harness, and prop, the airborne weight of the system is just over 7 ounces. The battery and switch harness seem to be a bit expensive, however.

• "Preparation For Use: The motor system is ready to use as supplied, but I did a couple of things to suit my own preferences. First, it was apparent that the brushes needed seating, so I put about 10 no-load hours on the motor on three cells. I also rearranged the pins in the Deans plugs so that the motor would plug more easily into my existing four-pin Deans-equipped battery packs and speed controls, with less chance of me shorting things out.

"I also acquired some 450mAh cells from Periphex, Inc.*, and I made a 6-cell pack from them, as I felt they might give better performance than the AAs and save almost an ounce of weight.

• "Performance: Bench tests confirmed most of the claims made for the motor; it is more efficient than previous small ferrites. For example, on the same input power (40W) as the old Astro 020 ferrite, it will turn the same prop about 1000rpm faster, and, since it draws much less current, it will run longer for a given battery capacity.

"Some comparisons with the 6x3 Rev-Up supplied with the Silver-Streak look like this:

Motor	Battery	RPM	Current
Silver-Streak	6-550s	11,270	7 amp
Silver-Streak	6-450s	11,400	7+amp
Astro 020 ferrite	4-800s	10,120	10 amp
Astro 035 ferrite	5-800s	11,800	11 amp
LeMans AP-29	5-800s	13,150	14 amp

"These figures are all taken 60 seconds into a run on a fully charged battery, through the Silver-Streak switch harness. Owing to the ammeter's losses, currents were measured on separate runs.

"The bottom line is that the Silver-Streak is a good replacement for the Astro ferrite 020, delivering more power and a longer run for about the same weight.

"These impressions were borne out in flight testing. I put the Silver-Streak in my Sorta Schoolboy, a 30-inch span, 3-channel plane, which includes a JOMAR* SC-5 throttle. I used a Graupner* 6x3 prop for flight testing, because I like them

(Continued on page 112)

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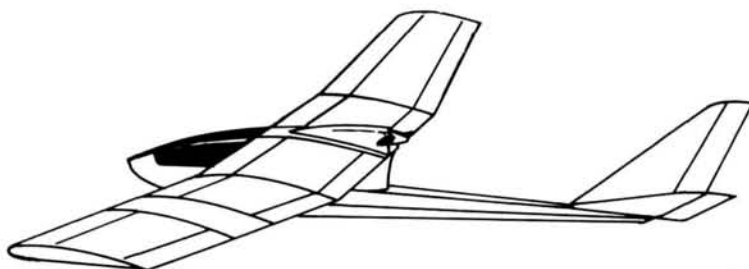
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QUIET FLIGHT

(Continued from page 111)

better, even though they load down the motor more (about 500rpm down from the Rev-Up).

"With an all-up weight of just over 16 ounces and a wing loading of 13 ounces per square foot, the performance was similar to my original Astro-ferrite-020-powered Schoolboy, even though the current airplane is fatter and 'draggier.' There was enough power available for a loop or two, and enough to justify throt-

(Continued on page 122)

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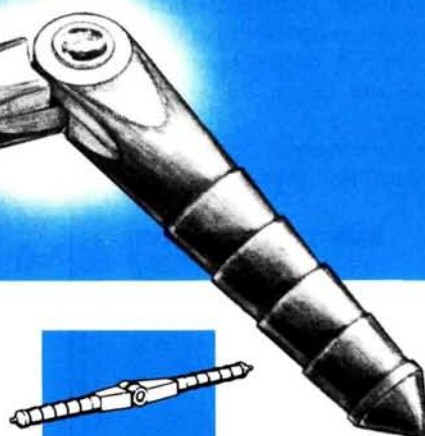
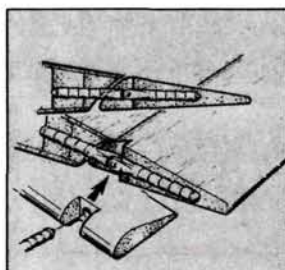
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QUIET FLIGHT

(Continued from page 112)

ting back and cruising from time to time as well.

"Flight tests with the 6-cell 450AR pack showed slightly livelier performance, due both to a few hundred rpm gain and the loss of almost an ounce of weight."

• "Additional Comments: Peck also offers the Silver-Streak with 4-cell packs. A few bench tests with 4- and 5-cell packs showed that they would probably work in a low-wing-loading airplane and give very long motor runs. A bench test on four 800s (an Astro 020 pack) gave an average 9000rpm into the Rev-Up 6x3 for over 10 minutes. I haven't tried any 4-cell flights yet, but I plan to, using an SR 450 4-cell pack I have.

• Summary: The Silver-Streak works well in places intended for the Astro ferrite 020 and would work where the 035 ferrite was intended (direct-drive only), too; as such, it fills a need. It's also the second-least expensive small motor (when purchased by itself) that I know of on the market today. Since it operates at such low currents, it should last a long time before the brushes wear out and force you to discard it. I think it will find acceptance by those of us who like little planes, don't want the weight or expense of the little Astro Cobalts, and can accept a lower performance level in return."

Well, once again, Bernard has supplied us with a motor review. This proves a point I've brought up before: There's a great wealth of information in club newsletters. If you're a club newsletter editor, please put "Quiet Flight," and MAN on your mailing list. Send in those newsletters; let's spread the wealth of information around.

Till next time...good thermals and a full charge!

*Here are the addresses of the companies mentioned in this article:

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Deans Connectors; available from Ace R/C Inc., Box 511, 116 W 19th St., Higginsville, MO 64037.

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Club of the Month

Evansville R/C Model Airplane Club

The Evansville R/C Model Airplane Club of Evansville, IN, is the *Model Airplane News* "Club of the Month" for February 1989.

We don't know how big this club is (growing so fast, they can't keep count?), but we do know that its members' enthusiasm for flying matches that of any club.

As well as their monthly meetings and weekend cruises to the flying site, the governing members have organized a number of activities to generate interest outside the club, as well as to keep the members involved.

Some of these activities include a "Model of the Month" contest, for which a few members are nominated because of their superior craftsmanship, and one is eventually chosen as the winner. The winner in this particular edition of the newsletter was Steve Stevens, with his modified Astro Hog, powered by an ST .61 engine and covered in a black-and-orange scheme. Steve took home a gallon of fuel for his efforts. A varied schedule of club fun flies, as well as the opportunity to attend other club events in the area, offer members a number of flying options. The ERCMAC also has a training committee that teaches less experienced fliers in the club how it's done. The club also boasts a video library with a selection of videos about model airplane building and flying.

It's with great pleasure that we at *Model Airplane News* award the Evansville R/C Model Airplane Club two, free, one-year subscriptions, to be awarded by them to a couple of the club's outstanding members. Congratulations!

Each month *Model Airplane News* will select the club newsletter that best shows the club's activities and energies directed toward the furtherance of the hobby. The award is not based on size or quality of the newsletter, and can be about any aspect of the hobby (F/F, C/L, R/C, boating, cars, etc.). *Model Airplane News* will award two free one-year subscriptions to be given by the club to outstanding junior members. So send your newsletter to *Model Airplane News*, Club of the Month Contest, 251 Danbury Rd., Wilton, CT 06897.

ROTOR HEAD

(Continued from page 80)

move up and down about 1/8 inch without the collective servo moving at all. Again, I re-checked for a slop-free system, and again it was fine. Once more changing servos, I found that loads imposed by my hands on the rotor head as if the helicopter were in flight, would allow about 1/8 inch swashplate movement, no matter what brand or quality of servo was used. At least, I now felt confident that I'd found the problem. But how could I fix it if these are among the best servos available with the highest torque rating?

I eventually corrected the problem by changing the radius of the servo arm. Because the four-blade rotor head required such a small movement of the swashplate for both collective pitch and cyclic controls, I was using the innermost hole on the servo arm to reduce the servo throw. However, it appeared that the slight servo-gear slop (which isn't usually noticeable) made a large input to the swashplate. I therefore moved the ball link out on the servo arm to its normal position, but I then had to find some other method of reducing the swashplate movement. This again could be done using the dual-rate function or servo-throw adjustment of the radio, but then I'd be back to the same undesirable position as before—or so I thought.

The easiest way to mechanically reduce the amount of swashplate movement was by using less throw on the bellcranks operating the swashplate. This was rather easy to do by adjusting the position of the ball link on the bellcrank driving the swashplate. By moving the ball link halfway closer to the center of the bellcrank, the pushrod movement going from the bellcrank to the swashplate was also halved. After this modification had been made, and pressure applied to the rotor head, the swashplate was noticeably tighter and had very little play. This all looked good on the workbench, but since I'd thought I had the solution once before, I was still rather apprehensive about further flight tests.

It so happened that there was a helicopter fun fly in Mesquite, TX, on the following weekend, and I decided that would be my final proving ground. I had nothing to worry about: The Scout 60 with its new four-blade rotor head flew well—as if I'd never had a problem at all!

Flight Evaluation

The Scout 60-4 felt different with its new four-blade rotor head, rather than with the standard two-blade head, but it's very

(Continued on page 128)

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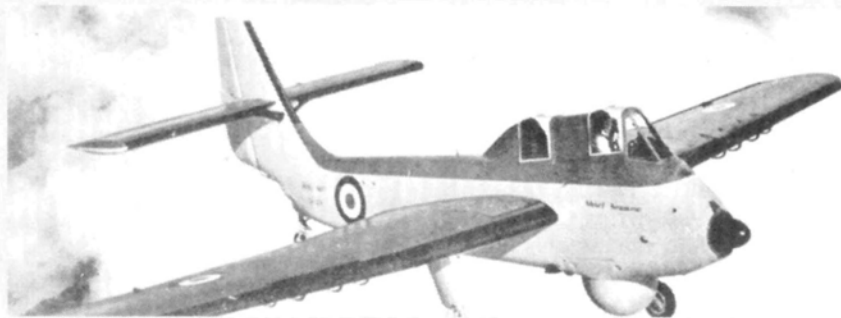
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NAME THE PLANE CONTEST

Can you identify this aircraft?

If so, send your answer to **Model Airplane News**, Name the Plane Contest (state issue in which plane appeared), 251 Danbury Rd., Wilton, CT 06897.



Congratulations to Bob Baldwin of Surrey, British Columbia, Canada, for correctly identifying the French Nord 1405 Gerfaut II shown in our December issue. Bob's entry was drawn from the 21 correct answers submitted.

In addition to being the first high-powered, jet, delta-wing aircraft to fly in France, it was the first aircraft to exceed Mach 1 in level flight without the use of an afterburner or rocket power. Built as a single-seat research vehicle, the Gerfaut was powered by a 6,200-pound thrust SNECMA Atar turbojet, spanned just over 21 feet (in the 1B version) and was of all-metal, monocoque construction. It made its first flight on January 15, 1964, and it exceeded the speed of sound just seven months later on August 3.



The winner will be drawn four weeks following publication from correct answers received by postcard delivered by U.S. Mail and will receive a free one-year subscription to **Model Airplane News**. If already a subscriber, the winner will receive a free one-year extension of his subscription.

ROTOR HEAD

(Continued from page 127)

difficult to describe the difference in feeling. Was it more or less sensitive? No. Was it harder or easier to fly? No. Was there more or less control? No. I can best describe its flight characteristics as very stable, precise and without any lag in the control system. It didn't take long to feel really at home with Mr. Schluter's new four-blade rotor head, and, although I haven't tried all the maneuvers in "the book," I know I won't be disappointed with the Scout 60-4's performance.

Conclusion

One of the things that surprised me about this four-blade head was that I didn't lose any rotor speed compared with the normal two-blade system. That seems rather surprising, because the engine now has to move *four* blades through the air, but the O.S.* 60 didn't seem to notice the difference. I measured the area of the new rotor blades, and although each is smaller than a normal blade, the total blade area is 1.5 times that of the two-blade system. Built according to Schluter's instructions, with no additional weight, each blade weighed about 180 grams. Collectively, that seems like a lot of area and weight to be spinning around, but, once in flight,

you'd never know the difference.

However, *before* flight there's a great difference. As soon as I took the Scout 60-4 out of the car, it drew a crowd; multi-blade rotor heads are rather scarce here in my part of Texas, and everyone had questions. I had the entire field to myself for the test flights, and one of the most impressive times was when the rotor blades were just starting to come up to speed. It was really impressive to see those four blades starting to turn; they almost looked as though they were going backwards (like the wheels on a stagecoach on TV) and then, at normal rpm, the entire rotor disc was a dense white.

Since I'm so impressed with the flight performance of Robbe's four-blade rotor head, I'm looking forward to placing the Scout 60-4 in a nice scale fuselage where it will really be able to show off its unique qualities. That would make a wonderful combination for everyday fun flying and also be a show-stopper at fun flys.

Although I haven't had an opportunity to try Mr. Schluter's *three*-blade rotor head, my comments should also apply to that system. If you have a different opinion, or know better techniques, please let me know, so we can all benefit from your knowledge.

*Here are the addresses of the companies mentioned in this article:

Schluter; distributed by Robbe Model Sport 180 Township Line Rd., Belle Mead, NJ 08502

O.S.; distributed by Great Planes Model Distributors, 1608 Interstate Dr., P.O. Box 4021, Champaign, IL 61820.

GOLDEN AGE

(Continued from page 85)

wired to a common connector to suit the receiver. You bolted in the servo board and then installed the receiver in foam rubber. Note the need for *pure foam rubber*—not plastic foam or anything else. Early on, we learned that rubber substitutes did a good job of *absorbing* vibration but did little to *isolate* vibration which was the real need. When this was first realized, there was much concern about the need to use *foam rubber*, but we seldom hear anything about this now. Another simple safeguard overlooked with time?

A review of the CL-5's instruction manual shows close attention to all the minute details that a novice R/Cer would find useful. One concise section dealt with tuning the receiver RF to the transmitter. Just as with single channel, you

still had to *tune* before flying!

After lengthy development, and at about the time that the CL-5 reached the market, the digital concept arrived. The results of the major investment in time and money that Dee Bee Engineering had put into the CL-5 had to be a disappointment with the arrival of digital—the result was as one would expect.

Some more recent input from Dr. Shabot seems timely. When I discussed the Space Control system, I mentioned the “gold brick” version as an updated, final offering. Now, 25 years later, Dr. Shabot has provided pictures of a like-new gold-brick system!

Remember the Cuban missile crisis in 1962? Keith Klensch of San Francisco was into R/C at the time. If you can recall, the possibility of war made everyone gloomy. For one thing, we knew that, with war, many items would be difficult to obtain or unavailable, and in anticipation, people began to stock up on items like food, medicine, cars, survival items—who *knew* what would be in short supply? Keith, as an enterprising R/Cer, thought of his greatest need—a new radio! He rushed to his local hobby shop and grabbed the only remaining, most sophisticated R/C system—a Space Control. No war would interrupt *his* flying!

As often happens, Keith's action didn't work out exactly as he'd anticipated. The Space Control, in its box, went on the shelf while he spent months building his dream model for it. Meanwhile JFK took care of the missiles and the R/C industry moved on to digital systems. By the time Keith, with a great effort, had completed his dream ship, only *the best* R/C system would be good enough for it, so the model eventually flew with the latest digital equipment, and the Space Control remained on the shelf for 25 years! Dr. Shabot reminds us that the unexpected often happens. In his wildest dreams he never expected to have a new, in the box, Space Control for his collection!

Along with this news and the photos, Dr. Shabot enclosed some old magazine copy that seems pertinent to my topic. One item was a forgotten report on Space Control by me! Remember, I mentioned S.C. updates designed to eliminate temperature and humidity “drifting?” In the report, I told how fellow modeler and electronic genius, Carmen Tona, had developed a cure. I described the necessary changes and how to accomplish them. Paralleling Don Brown's thinking, I also told how to add both a “spin” and a “brake” button. The gold-brick S.C. was a much finer radio because of simple nods like these. Such helpful reports



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were the mainstay of R/C in those days; they kept the action moving forward and ensured progress.

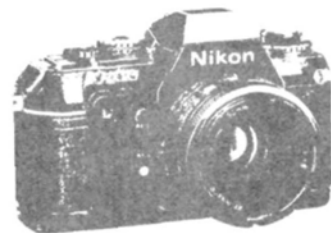
Also included in the package was another do-it-yourself article by D.D. Foss. For some reason, the “red-brick” concept didn't appeal to all R/Cers. Some unfortunately damaged the exposed printed-circuit board (bench accidents or crashes). Foss repackaged the receiver in an armor-clad case; by installing the components in a heavy-duty aluminum channel, nothing critical was left exposed, and there was also a claim of reduced size. Again, it took time and experience to develop the goodies we enjoy today, and imaginative, industrious modelers contributed much to the progress.

The photos of the S.C. are unusually good. Note the relocated trim and engine knobs on the transmitter. The background is the box logo, which shows Zel Ritchie using a “buddy box” to teach someone (Space Control probably initiated the buddy-box system). The other photo shows the airborne system; note the exposed receiver circuit board. (This was coated with epoxy for protection, and the intricate pattern had a beauty of its own.)

(Continued on page 132)

Wanted:

AUTHORS CONTRIBUTORS PHOTOGRAPHERS



We think a lot of our readers have ideas that are worth sharing. How many times have you read an article and said, “I could do that!” or “That's not the only way to do that; mine's easier!” Could very well be! Here's your chance! We'll be expanding **Model Airplane News** and are looking for additional contributors to help us accomplish this objective. Of key importance is the ability to take good photographs; the writing we can help you with. Interested? It's much easier than you might think.

Let's hear from you. Send in your ideas, articles, thoughts and photos; we're looking forward to it.

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GOLDEN AGE

(Continued from page 129)

O/T Plans

I recently mentioned Tom Dixon* as a possible source of OT R/C plans. As well as an extensive list of C/L plans, he has some R/C plans and always wants more. With *your* cooperation, his OT R/C list

has increased substantially; samples are the Stormer, Smog Hog, Orion, Kwik Fli, etc. Tom asks \$2 for his catalog of OT C/L and R/C plans, and he includes Australian info on propellers. Tom is willing to make the big effort needed to supply copies of OT R/C plans; all he needs is the Loan of an original for about a week.

Missing Person

We see the "missing person" announcements on TV, asking for information on their whereabouts. The "Golden Age of R/C" isn't into that, of course, but I do try to help when I can. Does anyone know a Lurie Dawson "Jack" Gore? He was an active R/Cer in the late '50s, judging contests in Florida, among other things. E.E. Hopkins*, an OT R/C buddy, would like to know his whereabouts. What say, all you sleuths?

Engine Charts

Earl Poynter of Ft. Worth, TX, checks in with more info and suggests that we could use practical engine-performance charts, if someone would take the time to put the data together. We just need simple, practical, useful facts: type of engine; suitable prop and fuel; expected rpm range with that combo—data that's easily associated with our own models and readily understandable. We need info that fits any model, bypasses all the advanced mumbo jumbo, and makes it easy to choose the right engine for that new model. Earl provided some charts from foreign magazines, which apparently make a practice of this. Like the idea?

Earl also notes the current movement

(Continued on page 136)

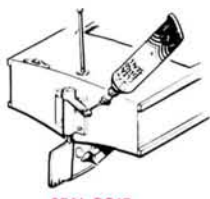
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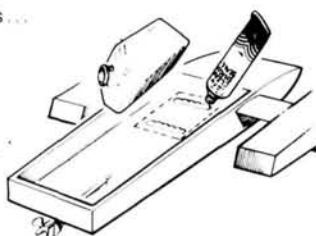
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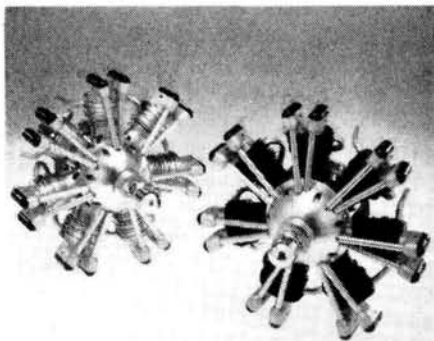
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GOLDEN AGE

(Continued from page 132)

that suggests using R/C to control FF duration models. One of its advantages is that it would allow the use of small flying fields. Earl asks "What's new?" with a copy of Larry Conover's FF commentary, dated 1965. Briefly, Larry's '65 suggestions parallel modern ideas: R/C for engine shutoff and dethermalizing. In '65, Larry added thermal searching (steering), which might be beyond the intended purpose of FF. A question now might be: Would the unpredictability of those early radios have caused any *real* progress, compared to the mechanically reliable ones already in use? Today, it's a whole new ball game; do you suppose Larry foresaw it 23 years ago?

OT Organization

For those of you who've asked for an OT R/C organization, there's good news. As I

write, I have a problem with timing, because you may already have seen my November announcement, which I now bring to your attention again so that you can act on it. In the November issue, I asked for your input to establish OT R/C officially. Bill Winter recognized the need, and your responses have substantiated it. For the past year, many have been active behind the scenes doing the necessary groundwork, and recently, Joe Beshar* stepped forward as moderator—one who's willing to take the initial steps. It's amazing how much thought and effort it takes to start a new organization; and, with his S.A.M. experience, Joe is well-qualified. Just send a post card to Joe to tell him you're interested; let's hear from you!

**Here are the addresses of the people you might want to contact:*

Dr. Michael Shabot, 27286 Eastvale Rd., Palos Verdes, CA 90274.

Tom Dixon, Suite 401, 1938 Peachtree Rd., Atlanta, GA 30309.

E.E. Hopkins, 101 Rockingham Dr., Wilmington, DE 19803.

Joe Beshar, 198 Merritt Dr., Oradell, N.J. 07649.



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